November 1982

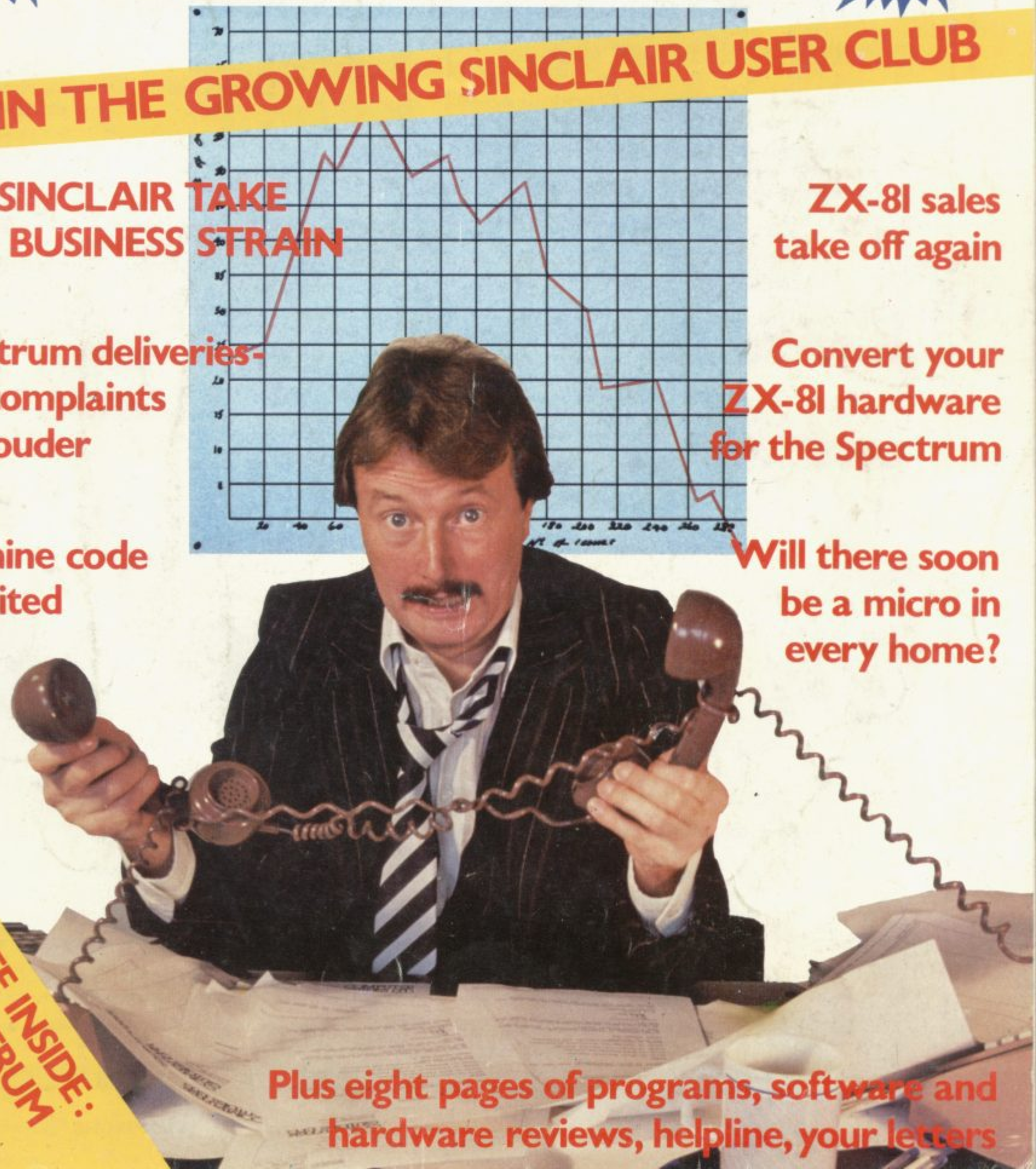
The independent magazine for the independent user

sinclair user

Issue No 8

Only 60p

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Spectrum deliveries- the complaints get louder

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Will there soon be a micro in every home?

FREE INSIDE: SPECTRUM USER

Plus eight pages of programs, software and hardware reviews, helpline, your letters

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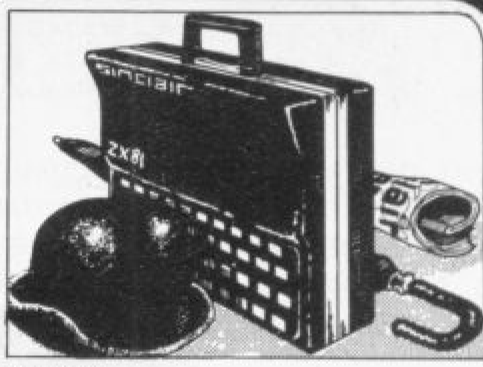
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FREE INSIDE — Spectrum User

NEXT MONTH

Our Christmas issue will look at good ideas for Christmas presents. We also look in depth at printers and the new range of Spectrum software from Sinclair Research.

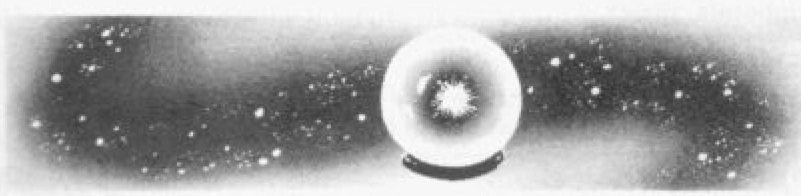


Great expectations

AMONG the many qualities required to be a home computer enthusiast, two of which are of growing importance, are scepticism and patience. Both are needed to cope with the ever-lengthening list of products which have been announced to an eager public but which have yet to appear on the market. The Microdrive is the best, or worst, example in the Sinclair Research market but the list could be expanded to include the Binatone £50 computer and the Acorn Electron.

The reasons for kite-flying are usually to do with commercial advantage, with an element of follow-my-leader. One company will announce a forthcoming product to delay people taking decisions about buying. If it has a glowing specification it may encourage many customers to wait for the new gleaming advance in the march of technology rather than be satisfied with the more mundane products already available. Other companies bringing out similar products feel they have to follow suit to compete.

It should be added that there are accidental leaks of information about a new product — against the

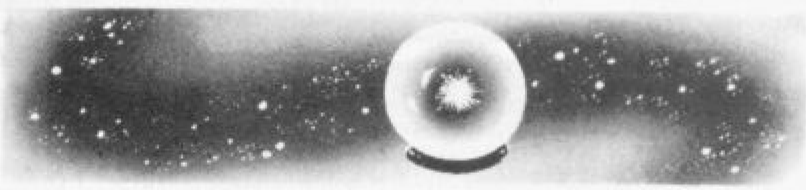


wishes of the firm involved. In the microcomputer market, however, it is a rare occurrence.

There is little to be criticised about making such announcements if they are accompanied by a firm date by which they should be available. People can then have most of the necessary information available and decide between waiting, say, six months or buying what is on the market already.

What is unacceptable is the growing habit of announcing the product while it is still in the early stages of development. The prototype may have been produced or the theory may have been determined but nothing done about the problems of mass production and the cost of manufacturing large quantities. All that can be said is that it will be available soon, with the exact date of its appearance retreating into the far distance and more people asking when it might go on sale. The result is that the market is confused and will remain so until the product appears or the company admits that it cannot manufacture it.

In most industries the announcement of a forthcoming product would not present great inconvenience to the consumer. People have experience of the time-scale involved and can make allowances. If BL says that a new model is being

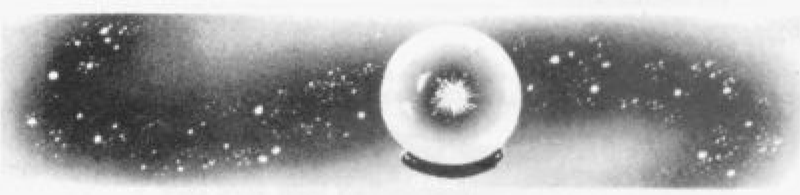


developed, potential customers realise that it could be many months, at least, before anything is seen of it.

It is a different matter in the field of microelectronics. The speed at which new products reach the market has been phenomenal and the way people can react has been equally fast. Eighteen months ago few people had heard of ZX-81, let alone the revolutions it would create in the home computing market or the mass of cottage industries and small businesses which grew on its back.

Expectations have been raised to such an extent that when a product is announced, the public expects it to be available immediately. The experience with the Spectrum shows the size of the problem, even when the product has reached the first stages of production. Orders arrived and many people were expecting to be able to buy a Spectrum at the launch at the Earls Court Computer Fair in April.

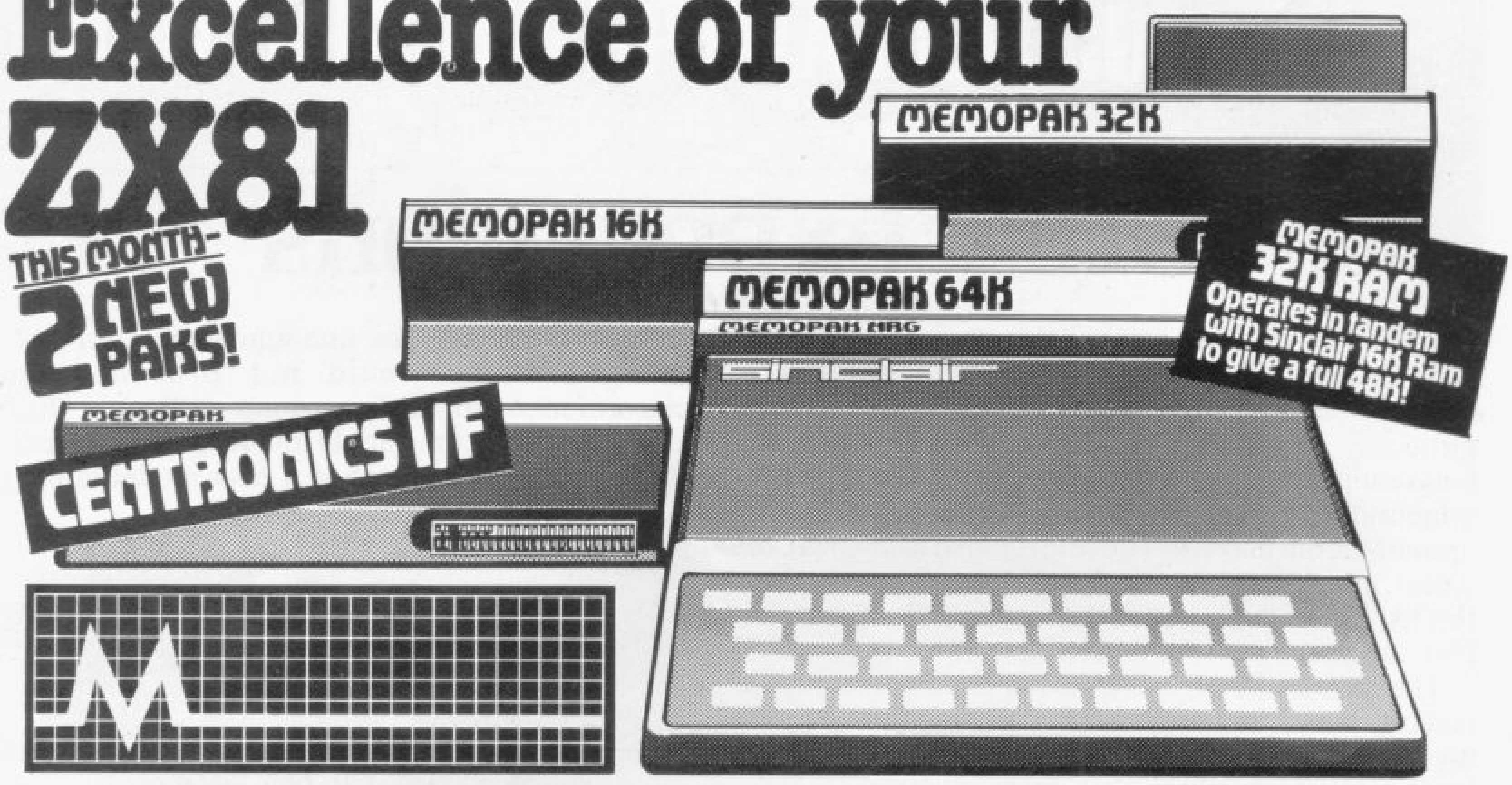
It is unnecessary to repeat the many complaints about deliveries of the Spectrum but it will be necessary to forget the problems only when the



lessons have been learned and the industry ceases to play on those expectations by making promises which it cannot fulfil in the time which home computer users feel they have a right to anticipate.

Until then users will have to be sceptical about claims for future products — and be patient about waiting for them to appear.

MEMOTECH Explores the Excellence of your ZX81



Memotech's Memopak Range

All five of the currently available Memopaks are housed in elegant black anodised aluminium cases, and are styled to fit wobble-free onto the back of the ZX8l, allowing more add-ons (from Memotech or Sinclair) to be connected.

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The 64K Memopak extends the memory of the ZX81 by 56K, and with the ZX81 gives 64K, which is neither switched nor paged and is directly addressable. The unit is user transparent and accepts commands such as 10 DIM A(9000).
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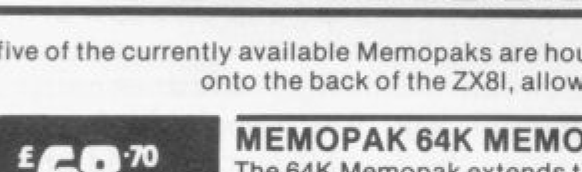
HRG Main Features — • Fully programmable Hi-Res (192 × 248 pixels) • Video page is both memory and bit mapped and can be located anywhere in RAM. • Number of Video pages is limited only by RAM size (each takes about 6.5K RAM) • Instant inverse video on/off gives flashing characters • Video pages can be superimposed • Video page access is similar to Basic plot/unplot commands • Contains 2K EPROM monitor with full range of graphics subroutines controlled by machine code or USR function

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A complete range of ZX81 plug-in peripherals

Digitising Tablet **RS232 Interface**

We regret we are as yet unable to accept orders or enquiries concerning the above products, but we'll let you know as soon as they become available.

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The sinclair user Club

Join our club for Christmas

CHRISTMAS is approaching and now is the time to start thinking about all those difficult decisions regarding presents. If you know anyone who is an enthusiastic user of the Sinclair Research ZX-81 and Spectrum, you need look no further.

The perfect gift would be a year's membership of our Sinclair User Club. For only £12 you can give a present which will last all the year and never diminish in interest.

Just complete the form on this page, enclose £12 to us at the address on the coupon — giving the name of the person to whom the present should be sent and whether he or she has a ZX-81 or Spectrum — and you will be opening a new world for them.

Please state on the coupon that it is a Christmas present and we will ensure that the membership card arrives at the proper time.

The benefits, as can be seen from the accompanying items on the club page, are numerous and growing. Do not delay and we will ensure that you have given the perfect present.

Kayde graphics price cut by 10pc

STAR BARGAIN

AGAIN this month we have been able to maintain the high standard of special offers.

We have secured a discount of 10 percent on the graphics board supplied by Kayde Electronic Systems of Great Yarmouth. That reduces the price from the usual £29.95 to £26.95, exclusive to club members.

The software offer this month involves savings on cassettes supplied by J P Gibbons of Orpington, Kent.

On the business side there are the Personal Banking System and the PBS bank reconciliation modules. The banking cassette sells normally for £9.95 but we can offer it at £9 and the cost of the reconciliation module has been reduced from £6.50 to £6. Another saving can be made by buying them together for £14.

Finally, members can save on the cost of Casino One, the new J P Gibbons cassette for the Spectrum. The cassette, which normally contains the usual casino games such as Blackjack, Craps, and Roulette, sells usually for £4 but for members that has been reduced to £3.50.

As usual, all these bargains are only for members of the Sinclair User Club and are available until the end of November.

Growing world-wide appeal

THE GROWING Sinclair User Club is acquiring an international flavour, with members from all over the world. Apart from Britain, there are five nationalities represented in the present membership list, including Norwegians, Dutch, Saudia Arabians and people from Gibraltar and New Guinea.

It is an indication of the world-wide appeal of low-cost, high-output Sinclair machines and also of the widely-spread readership of *Sinclair User*.

Our club can now offer even more services to members. To help ease the problems of loading cassettes, members can have the heads on their cassette players aligned at a nominal cost of £5. The result will be that mem-

continued on page 8

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name ....

Address ....

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....

Which computer do you own?

ZX-81 ☐ Spectrum ☐

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.

The Sinclair User Club

continued from page 7

bers should then be able to load any cassette which has been recorded on machines which have their heads correctly aligned. Further details can be obtained from us at the Sinclair User Club.

The service is offered in addition to the many others of which members can take advantage for the small cost of £12 per annum.

Other benefits include a bi-monthly cassette-based newsletter containing various items of interest to club members, a problem-answering service, programs and special features. There are also special offers each month with savings on popular items which allow members to recoup the membership fee quickly.

Members can take advantage of a telephone advice service, the number of which is given on the cassette. If they have any difficulty using the Sinclair machine, they telephone the number and obtain expert advice immediately.

The activities of the club are dealt with each month in the special club pages. To take advantage of all the benefits, complete the application form today, making sure you indicate which machine you own so that we can send the correct cassette.

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.

Edinburgh ZX Users' Club: J. Palmer (031 661 3183) or K Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80/81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80/81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth monday of each month.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire, PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

National ZX-80 and ZX81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80/81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent, (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: Andrew Moore, 1 Ketton Avenue, Sheffield S8 8PA would like people interested in starting a club in the area to contact him enclosing a stamped-addressed envelope for details.

Sittingbourne: Anurag Vidyarthi (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and software library.

Thames Valley ZX Users' Club: Richard Shepherd, 22 Green Leys, Maidenhead, Berkshire SL6 7EZ; (0628) 21107 (evenings and weekends). Hopes to start meetings on a regular basis.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH (Walsall 25465). Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium, France, Luxembourg: Club Sinclair, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468)

Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epéestraat 14, B-1200 Brussels, Belgium (322 7349954)

Denmark: Danmarks National ZX-80/81 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZX-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre. Gratis medlemskab og gratis blad til enhver interesseret.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J.S. Wijaya, Jakarta, Indonesia.

Republic of Ireland: Irish ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

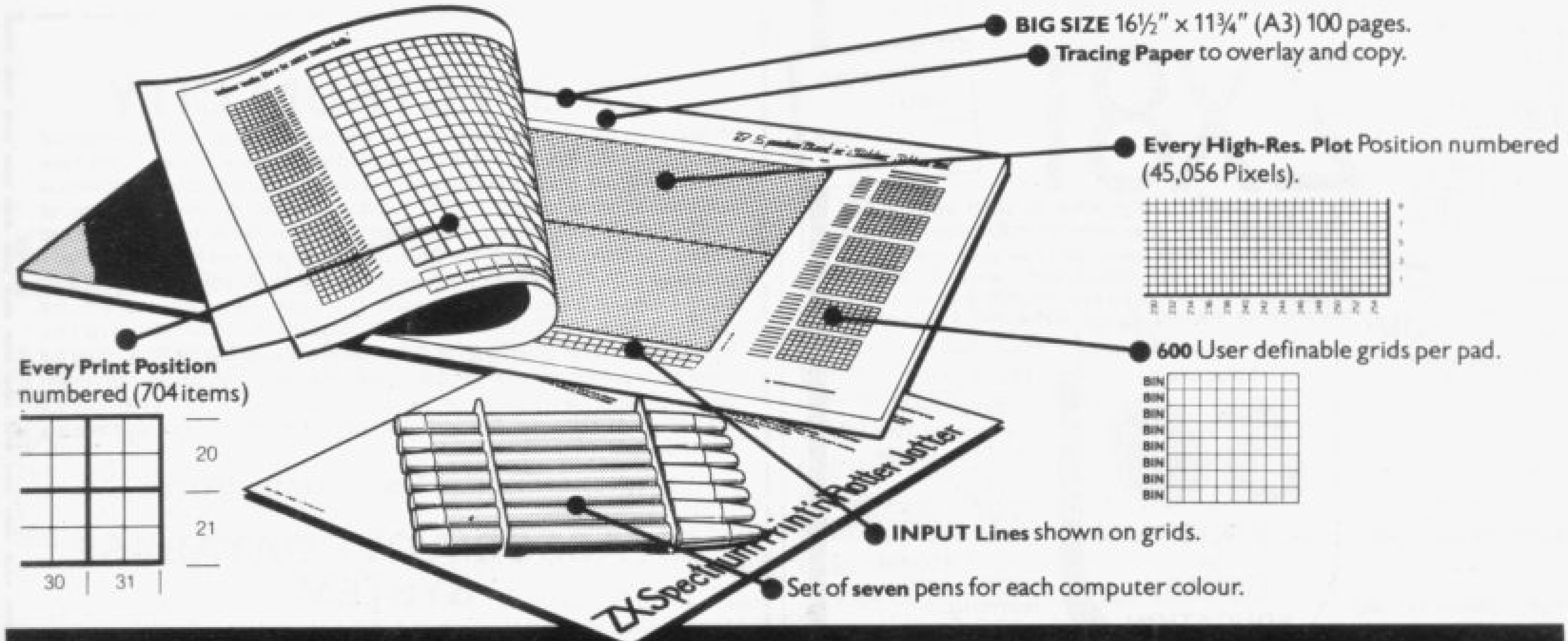
South Africa: Johannesburg ZX80/81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg. Teaches Basic and machine code, interest in hardware.

Johannesburg ZX Users' Club: Lënnërt ER Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana.

International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).



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Just part of a range of ZX products

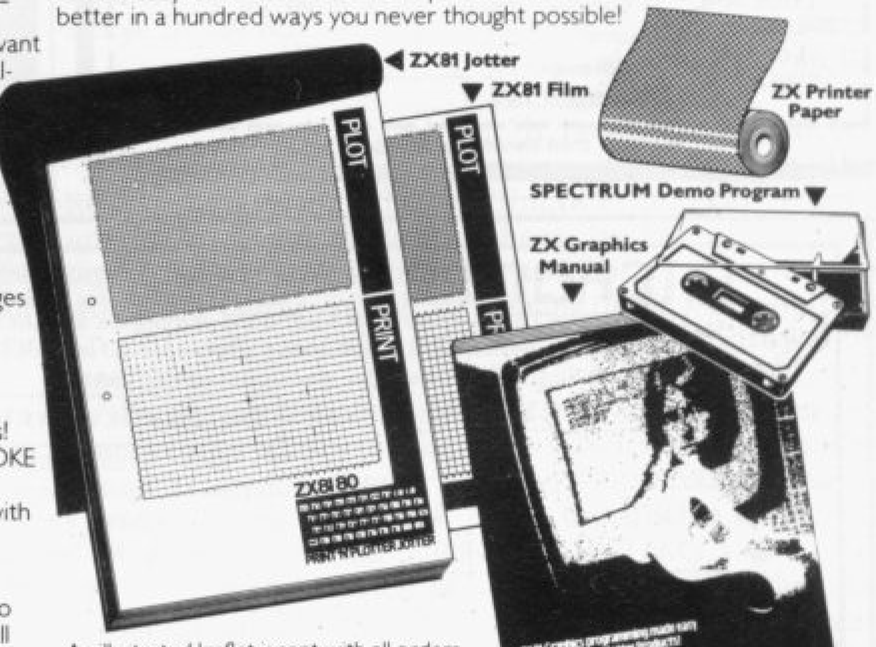
The Spectrum Jotter is, of course, an upgraded version of our popular *ZX81 Print 'n' Plotter Jotter and Film*. For ZX81 owners these are available by direct mail or through a growing number of retailers and compshops.

The ZX81 Jotter is a 100 page Graphics pad that exploits to the full the graphics facilities of that micro. ZX81 Film is a matt film version of the Jotter which is re-usable and ideal for 'copying' graphics.

Our manual: *"ZX Graphics programming made easy"* explains everything you need to know about using the ZX81 products, and when used in conjunction with the Spectrum cassette will prove to be the definitive guide to the subject.

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An illustrated leaflet is sent with all orders. If you require a copy before ordering write enclosing a first class stamp.

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ZX SPECTRUM CITY

Within a few weeks of getting our first ZX-81 we had a good working version of "MONOPOLY". We did not think it would sell so we scrapped it. We have been kicking one another ever since! However, it was developed in parallel to a mainframe game called "CITY" which was an enhanced version of "MONOPOLY" played on a street map of London rather than the standard board. The street map took up a few hundred kilobytes and thus was not easily put into the ZX-81. The basic mechanics of the game are available for the ZX-81 but the game is played on a blank map. The streets are constructed with the buildings. Now, along came the SPECTRUM with 48K of RAM and in went the street map, not London but an imaginary town. The colour facilities made the program simpler than the mainframe version because much more information can be displayed to the player on one screen. In the end 'CITY" is not at all like the game that inspired it. Everyone that we have invited to test it says that it is much better!

16K ZX-81 CITY £6.   48K ZX SPECTRUM CITY £8.

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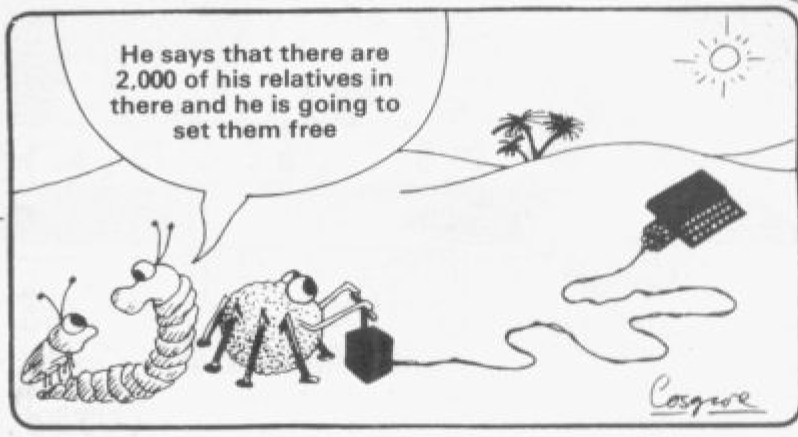
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GAME FOR A LAUGH — this is the winner of the cartoon caption contest held at the recent Microscene Brum 82 exhibition. It was from John Stokes, of Kingswinford, West Midlands and he wins a selection of Spectrum cassettes.

The organisers say the show was a great success with more than 3,000 visitors.

Sales of ZX-81 revive strongly

SALES of the ZX-81 have revived strongly since the price was reduced to less than £50 and the number of retailers was expanded.

A spokesman for Sinclair Research said there had been a five-fold increase in sales between July and August. They were then back to their best levels.

That was confirmed by John Rowland, market development manager at W H Smith, which has been retailing the ZX-81 for almost a year.

"Sales have really taken-off," he said. "They started to tail-off in May and fell further in June and July but they were almost back to their pre-Christmas levels in August."

Pretorious Systems

WE HAVE had correspondence from several readers complaining of non-delivery of products ordered from Pretorius Systems as a result of advertising in our June and July issues. It would appear that there has been a serious production problem with the company.

If your order has not been fulfilled and you have not yet communicated with us, will you please write to advise us of the date of your order and your cheque number?

Atari battle looms

THE FIRST MOVES in a possible copyright battle have been made by Atari against a small software house in the Sinclair market. The American-based company has written to DJL Software of Swindon asking for a copy of its **Zuckman** game to see if it breaches copyright on its **Pacman** games.

It is the first reported move by Atari in the Sinclair market where there has been a proliferation of Pacman-type games in the last month. It follows the withdrawal by Bug Byte of Liverpool of its **Vicmen** game written for the Commodore Vic-20 after Atari claimed that it was too similar to its own game.

Bug Byte said at the time that it did not feel it was infringing copyright but that it did not have the resources to fight a large company like Atari. DJL feels the same.

"I do not consider the game is a breach of copyright, as we are using Z-80 machine code, unlike the Vic game which was using the same machine code as the Atari game," said Dave Looker of DJL.

He added that he did not have the money to fight Atari through the courts but if anyone else wanted to contest any claims made by Atari he would be willing to join them.

Export difficulties

TOURISTS buying a ZX-81 in one country and returning home with it run the risk of finding they will not be able to use it when they reach home.

They may also find there is nothing they can do to correct the problem.

The difficulties arise because of differing television systems, voltage levels and mains frequencies throughout the world.

Tony Rand, export manager at Sinclair Research, does not advise anyone to attempt converting a ZX-81 and says it would be better to buy a specially-adapted machine.

"People sometimes buy them in this country to take overseas because they are cheaper here," he says. "They should realise that the difference in price is the result of the costs of making the adaptations and exporting to that country."

Powerful micro launched

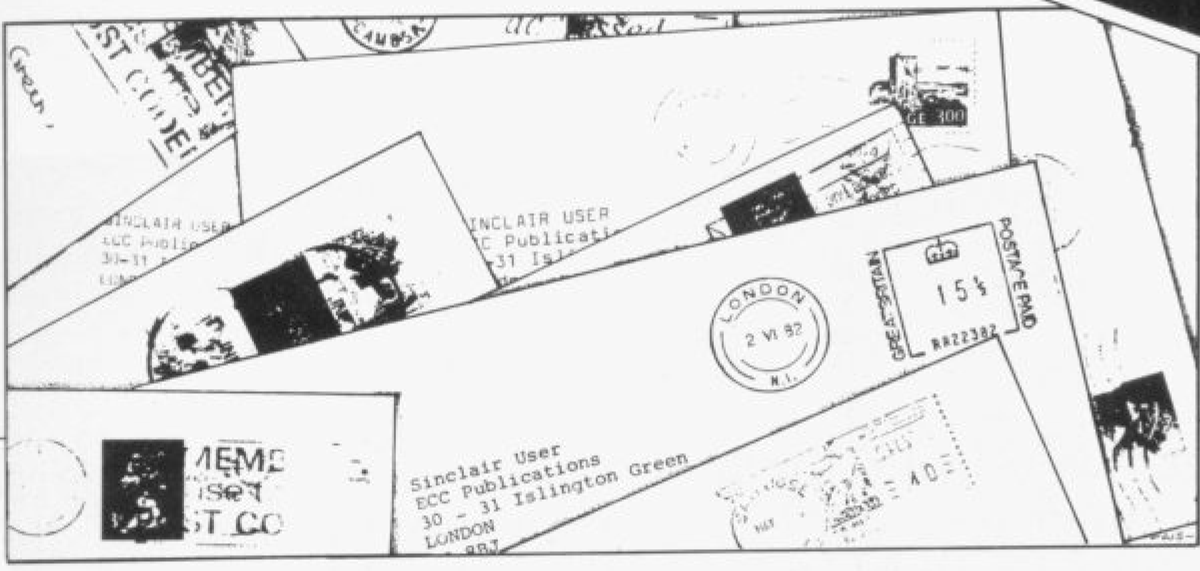
A NEW MICRO every month seems to be on the cards, at least for the foreseeable future. A new one called Oric One is to be launched this month.

The machine is to be produced by a new company, Oric Products, which has been set up by Tangerine Computer Systems. Peter Harding, Oric Products managing director, said: "Oric will be the most powerful and professional micro in its field".

The new machine will cost £99 for 16K and £169 for 48K. That undercuts the Spectrum by £10.

The technical specifications also beat the Spectrum. It uses Microsoft Basic and has 16 colours with a display resolution of 28 rows by 40 characters. Oric also contains a Centronics printer interface and tape cassette ports. A printer, modem, and disc unit are to be available soon after the launch.

The keyboard looks like a cross between the Spectrum and the Video Genie and the keys have a programmable audio feedback.



Poor printing frustrates

I BOUGHT my first copy of *Sinclair User* — September issue — and enjoyed it very much, especially the education articles.

I was, however, frustrated to find that I could use none of the programs listed in Program Printout because of the poor quality print, which meant that every one had at least one indecipherable line.

Why must you print the programs using this pseudo printout style which, because of the way the letters seem to bend when printed, make them difficult to read?

Kenneth Watson,
Gateshead.

•The reason for using what you refer to as the pseudo printout style is that by using printouts direct from the computer we find that we can reduce the number of errors which can easily creep into the printing of listings. We test all programs before we publish them and then attempt to use printouts which are as clear as possible, giving additional guidance in the accompanying material. There are occasions when mistakes occur but we try to keep them to a minimum.

Bleeper points expanded

I READ with interest your review of our Fulcrum Bleep in the August issue and would like to correct one or two points. The new improved Keyboard Bleeper is slim enough to fit under the ZX-81 PCB. I know of at least two customers who managed to do so. The latest version was designed with that possibility in mind.

The new Keyboard Bleeper was intended to replace the original version which gave a bleep for 198 characters. We presume everyone wants all 210 characters to bleep, especially as it costs the same.

Fulcrum Products,
Hillside, Steep Lane,
Findon, Worthing,
West Sussex BN14 0UF.

New use for old statements

HERE IS a way you can use the NEW and OLD statements on the 16K ZX-81 in a similar way to the BBC computer:

Load or type-in a program on your ZX-81.

To NEW the program, type POKE 16509,100. This, seemingly, will NEW the program.

To retrieve the program, POKE 16509,0. This may be useful if you are playing a game or writing a program and you have to interrupt it to write a small program — to total your shopping list, for example.

It is important to delete your shopping list program or whatever without using NEW before attempting to retrieve the original program.

Finally, try this with 16K:

10 POKE 16437,255
20 RUN USR 1.

Donald Grose
London, W7.

Simpletons' corner

I WOULD like to comment on a letter in your August issue from P Norris. He complained about the complicated competition dealing with producing an EPROM blower, whatever that is? Can we not have an easier competition for us simpletons? A children's page would not be amiss.

S Dodson,
Haxby, York.

•Thank you for the ideas, which we are considering. On the subject of the competitions, we set them to be a challenge to our readers, whom we do not believe to be simpletons.

Stopping the wobbles

I HAVE found a very easy method for stopping the 16K ZX RAM pack wobbling troubles, which invariably result in loss of memory. I find that if the ZX-81 plus RAM is placed inside the polystyrene box in which it arrives there will be no further trouble — it fits securely.

Jonathan Cheal,
Ferring, West Sussex.

Door stops solution

THE POWER UNIT supplied by Sinclair with the printer certainly becomes very hot but that does not cause many malfunctions of the printer or ZX-81.

Marion Stubbs' problem is caused by covering the only air entry on the ZX-81, i.e., on the base. When integrated chips become hot they consume more current until thermal runaway occurs. That can cause irreparable damage to the ICs.

My answer to the heat problem is to glue 1in. door stops to the bottom of the ZX-81. A wide rubber band round the ZX-81 and 16K RAM pack prevents any wobble.

V Dawson,
Prestwick, Ayrshire.

Kakutani 'corrected'

IAN STEWART is really in Argentina with his Kakutani problem. It should be:

```
  10 INPUT N.
  20 LET C = 0
  25 SCROLL
  30 PRINT N
  40 SCROLL
  50 LET C = C + 1
  60 IF N = 1 THEN GO
       TO 2000
  70 IF N = 2*INT (N/2)
       THEN GOTO 1000
  80 LET N = N*3 + 1
  90 GOTO 30
1000 LET N = N/2
1010 GOTO 30
2000 PRINT AT 21,0;
       "HIT LOOP IN
       □"; C; "□ STEPS
□ = BLANK.
```

Dr G A Jeffery,
Stanley,
Co Durham.



As leisure time grows, either through reduced working hours or unemployment, there is expected to be a great increase in the use of microcomputers. Bill Martin and Sandra Mason report

Less work and more play could suit Clive

MORE THAN 2,000 years ago, Aristotle made the comment that we work to have leisure. For him, leisure was a reality, since all the toiling and much of the producing was done by human slaves. For most other people then, and since, work has been the essential part of human life as people have struggled just to survive. Leisure has been, at the best, a residual and generally meagre amount of time.

Today, because of the introduction of computers and microprocessors, we are developing a new type of slave, in the form of electronic robots of all kinds. That represents a major change in our lives, which will give new meanings and new dimensions to work and leisure.

Perhaps, most of all, new technology means a growth in the amount of leisure time. That is not an unmixed blessing. Although people will need to work less, they will also have to learn how to develop their lives in the way Aristotle meant when he talked about leisure.

In some measure, we have already entered an age of leisure, with a milestone at the beginning of the 1970s when the amount of time the average full-time worker spent at work during a year fell below the amount of time available for leisure.

Since then, a typical worker's leisure time has increased by some seven percent to more than 2,500 hours a year, while the number of working hours has fallen to 1,950, including travel to and from work.

Less positively, we now have the large amount of enforced and maldistributed free time represented by more than three million unemployed.

With the expansion of free time and the need to find ways of occupying it in a satisfying manner, the development of the microcomputer, with its time-intensive quality in use, seems to be particularly fortuitous. Certainly home computers will become increasingly important in people's leisure lives but we need to be realistic about just how fast private ownership of computers will develop and also about exactly how the machines will be used.

Without becoming involved too deeply in the psychology of leisure, it helps when thinking of the possible roles microcomputers might play in our leisure lives to consider for, what we use our leisure. It is possible to identify three functions of leisure which form something of a hierarchy — rest and recuperation from work, entertainment and the relief of boredom and, finally, personal and social development.

> 'In 1970 the time the average full-time worker spent at work in a year fell below the time available for leisure'

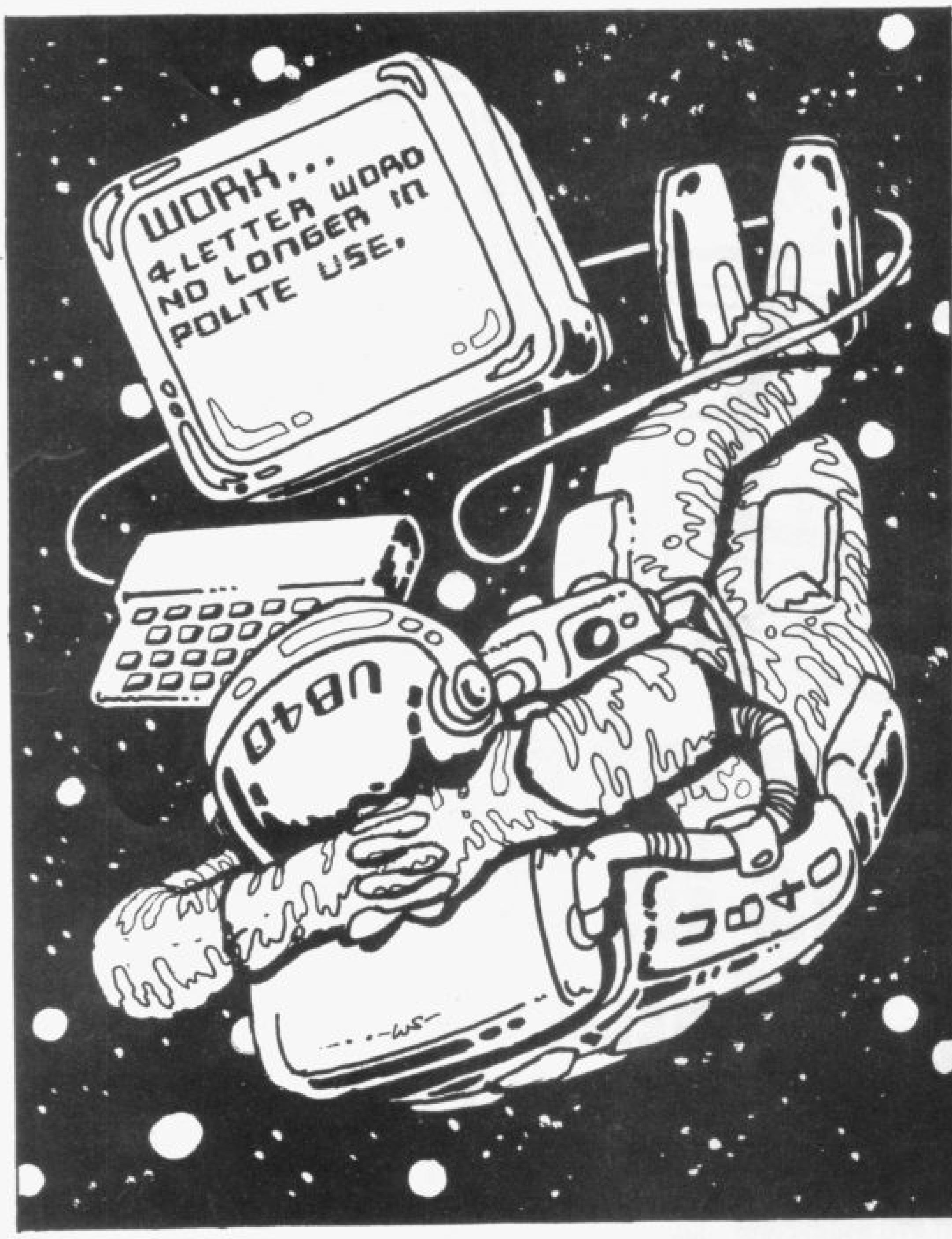
In the era of leisure we are entering the function of leisure as rest and recuperation declines in importance as the amount of work lessens and the effort involved decreases. That puts the emphasis in leisure time use on the two other functions of entertainment and self-development, both areas where we expect to see the microcomputer play an increasingly large part.

An obvious role microcomputers play in the area of entertainment is of being virtually an infinite compendium of games. They can provide an unending source of pastimes for those who wish to occupy their leisure in this way.

It could be argued that people could use a chess set or a pack of cards instead of a microcomputer for those simpler activities. The answer lies probably in the basic attraction of using new technology, as well as in the perpetual self-challenging quality of computer games and the wide variety of pastimes available from the one machine.

Once attracted to the computer, the games player is likely to look progressively for more complex games to play and may eventually take the key step towards developing improved or original programs. At that stage, the computer moves from being a source of entertainment to potentially a very time-consuming hobby, offering great opportunities for individual learning and development.

Many people have turned to microcomputers without any particular emphasis on games playing. Either way, and whether interest lies primarily in the hardware or software, all computer hobbyists have found a leisure occupation of



absorbing interest. In the future, when there may be considerably more free time but possibly not so much extra money to spend on leisure, the time-absorbing nature of computing is a valuable characteristic.

In addition, as members of computer groups know, there can be a strong social element in the hobby, producing new friendships as well as a useful exchange of experience and ideas.

There are other aspects of what we have termed self-development in which we believe the microcomputer potentially has an important leisure role to play. By self-development, we mean the whole process of learning and enlarging one's mental and physical capabilities with the aim of leading a fuller and richer life.

Naturally the microcomputer cannot take the place of weight-lifting, jogging or other sports in improving physical capabilities but, as a provider or aid to educational and cultural development, it could have a vital part to play. Previously it was often people of leisure who went to university to enjoy the benefit of learning, often for its own sake; in the future, the micro will help to take learning to the homes of all who want it.

How quickly will all this happen? How soon can we expect to see a micro in every home, as some commentators envisage? How many people will, in practice, be encouraged to use this new gadget to educate themselves and their families?

Our forecasts appear to be somewhat more conservative than those of many others. We expect that, by the end of the decade, something like one-fifth of all households, some four million homes, will have a micro bought for personal use; others, as now, will have machines used both for the business and family.

Behind that view lies the assumption that microcomputer prices will fall to around one-third of what they are at present. An even sharper fall in price obviously would boost demand. We do not think a very high proportion of the 33 percent of households where the head of the household is over 60 years of age will be buying a microcomputer, even if it costs only £10.

Despite the growing amount of free time, the majority of people are likely to be fairly slow to recognise what the microcomputer can offer them. The attraction of games-playing is obvious but for many people the idea of leisure as a period of education is a novel one and, during the 1980s, most of the demand for educational use is likely to be stimulated by children's needs.

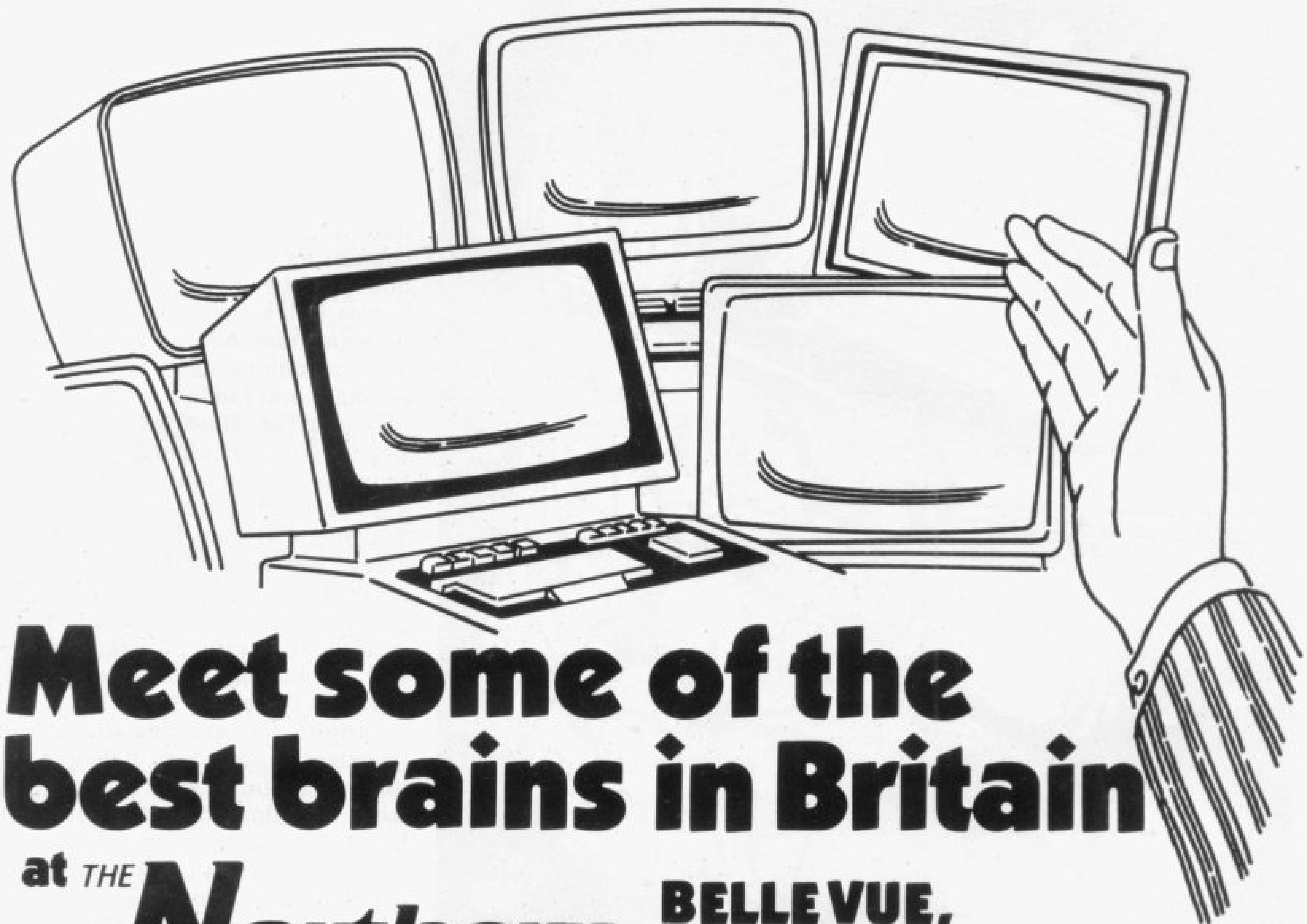
It will probably not be until the 1990s, when the first generation of children to whom computers are a part of everyday life become adults, that a real widespread educational use of home computers will develop.

Since many people, not least the unemployed, will be having a leisure problem well before then, we hope that those already keen on computing will do all they can to try to make our forecasts seem too pessimistic.

Aristotle probably would have enjoyed the challenge of micro-computing but even he might have needed some encouragement to take the first steps in this new leisure direction.

> 'By the end of the decade something like one-fifth of all households will have a micro bought for personal use'

● Bill Martin and Sandra Mason of Leisure Consultants, Sudbury, Suffolk have recently published a report on leisure in the 1990s.



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May the forces be with you

WAR GAMES, it seems, are forming part of the Sinclair users' staple games diet. Two recent offerings include the opportunity to be an aircraft gunner, zapping enemy aircraft out of the sky, and of controlling a naval task force sent to deliver a far-off island from enemy occupation — no prizes for guessing from where that idea arose.

The first, **Night Gunner**, casts you as a rear gunner in the turret of a bomber, firing at enemy fighter aircraft which weave about the screen. Good, clear graphics represent the enemy aircraft and a cross in the centre of the screen is the gunner's sights.

Each time you are hit by enemy aircraft, resulting in the loss of one of your three lives, the HIT flashes on the full screen, somewhat reminiscent of the scoreboard at an American baseball game.

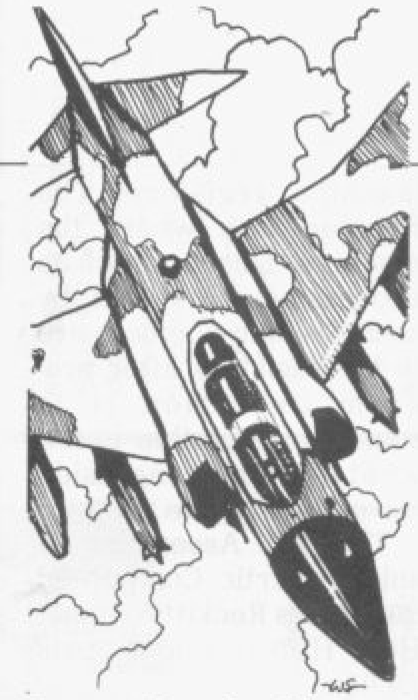
The cassette, a 16K game, costs £4.95 and is available from Digital Integration, 22 Ash Church Road, Ash, Aldershot, Hampshire GU12 6LX, and will also soon be available from retail outlets.

The chance to control even more fire power is presented in **Naval Blockade.** As commander of a task force sent to retake an occupied dependency, you have an aircraft carrier with five aircraft, a troop carrier and four frigates.

The idea is to land your troops on the island, which is at the centre of a 10 × 26 grid, having fought-off enemy attacks. The graphics in this 16K game are simple but clear, and movement is achieved by entering a series of co-ordinates and typed instructions.

Naturally, damage factors have to be coped with and missiles are not inexhaustible, particularly since the enemy bases are close to the island but you have the occasional advantage of intelligence reports.

Naval Blockade is from Hewson Consultants, Dept X, 60A St Mary's Street, Wallingford, Oxfordshire OX10 0EL for £5.95.



Frogs on the move

MOVING FROGS across a busy road and fast-flowing river into their homes can be a hazardous business. The DJL Software game **Frogger** is a fairly straightforward obstacle-avoidance trek from the bottom of the screen to the top, where five frog homes await their occupants.



The journey is aided by handy logs and turtles in the river on to which the frogs can jump but beware staying too long on the turtles — they have a habit of diving and that is the end of your frog.

Points are earned for each frog which reaches home and the arrival of all five leads to increased hazards — including more traffic on the road, alligators and snake patrols on the river banks — for the next game. The hazards continue to increase two more levels, so life for the frogs becomes more and more precarious.

The cassette costs £5.95 from DTL at 9 Tweed Close, Swindon, Wiltshire SN2 3PU.

Flying by numbers

FLIGHT SIMULATION and related subjects seem to be reasonably popular, especially now that most personal computers can use high-resolution graphics. **Fighter Pilot**, however, is not for a computer with such facilities but for the ZX-81 with 16K RAM.

The idea is that you are a fighter pilot taking-off and returning to your base. You are given two options at the beginning of the program, either to take-off and fly around, then land, or to try to land on the runway.

All that sounds simple but it is very difficult, because you are flying blind. The display for the simulation is just a series of boxes with monitor readings in them. It takes a long time to get used to them.

The game is a little dull but the simulation is interesting. Fighter Pilot is available from Digital Integration, 22 Ash Church Road, Ash, Aldershot, Hampshire. It costs £5.95.

Assembler from Artic

MACHINE CODE is becoming more popular as the personal computer market expands. The reason seems to be that Basic is very slow to use and fast interactive graphics games are not possible without using machine code. The new Artic Computing **ZX Assembler** aims to make the job of compiling machine code easier

Continued on page 18





Continued from page 17

for beginner and expert alike.

The program is written in machine code and can be called from Basic. It is possible, therefore, to program in Basic without losing the assembler from memory.

The code to be assembled is put into a REM statement at the beginning of the program. The code can be written in the standard Z-80 mnemonics. Ordinary text which is to be printed on to the screen can be written directly into the assembly code and will be turned automatically into hexadecimal.

A useful command which can help to debug machine code programs is display and modify machine registers. The registers are where the machine does much of its processing work and by seeing which numbers are in the registers after program execution it is sometimes possible to tell what is going wrong inside the machine code routine.

The ZX Assembler is sold by Artic Computing, 396 James Reckitt Avenue, Hull, HU8 OJA and costs £9.95.

Asteroids with smooth action



ASTEROIDS is a fairly standard game on the ZX-81 and many software houses have produced a version. The Software Farm has now jumped on to this bandwagon and produced its version.

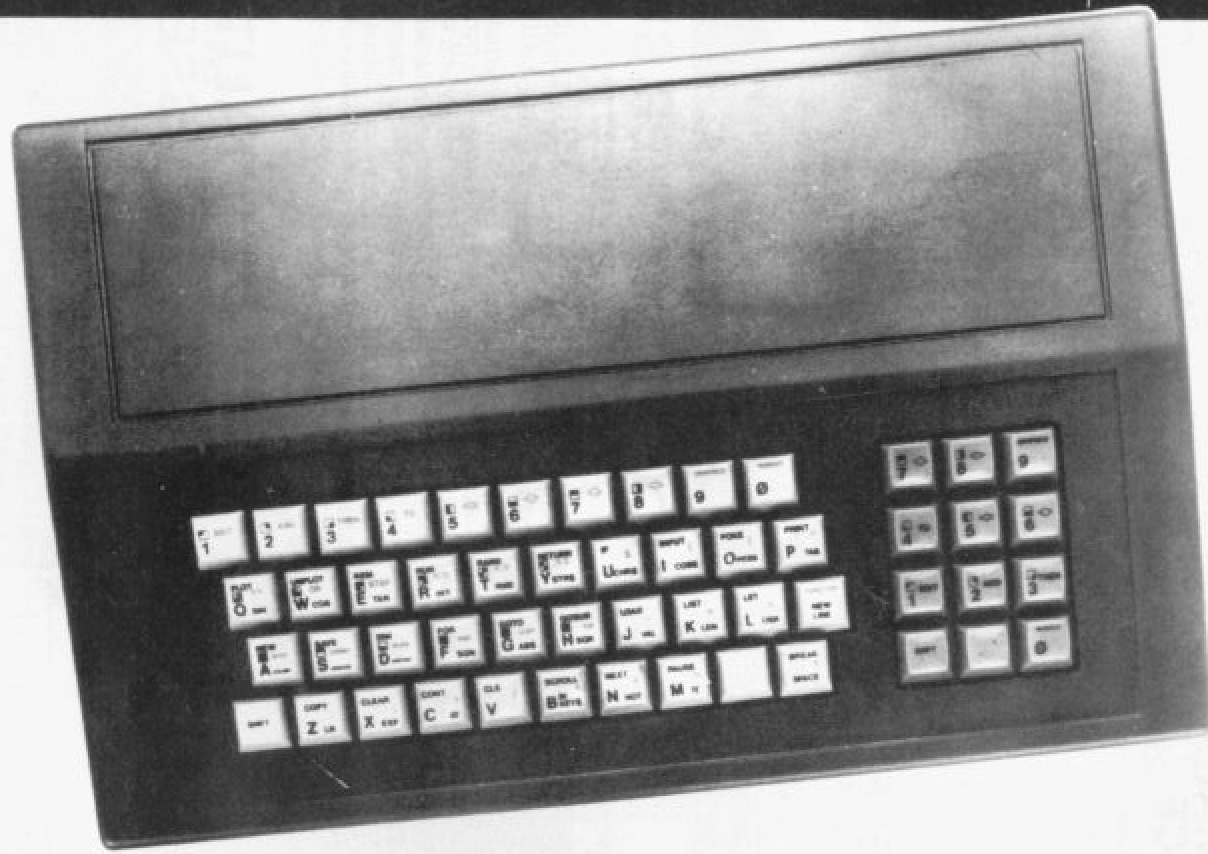
The graphics of the game are fairly chunky but the action is very smooth. The screen has a wrapround effect, so that as well as being able to spin around in space your ship can move forward. It will disappear from one side of the screen and reappear at the other.

If you fire when the ship is off the screen or just about to disappear, a very strange effect occurs. You press the fire button and the laser beam, shot from the nose of your ship, continues off the edge of the screen and appears on the other side. That effect is on several versions of the game at present available and it seems to be a disadvantage of having a wrapround screen.

Apart from that, the game is reasonably fast and the asteroids are very difficult to miss, as they break-up after you have fired at them, only to fly back in the face of your ship.

Asteroids is sold by The Software Farm, Craigo Farm, Botany Bay, Tintern, Gwent, and costs £5.95.

ZX KEYBOARD



Our new cased keyboard has 52 keys, 12 of these are used for the numeric pad. The numeric pad offers some useful features; you can cursor with one hand and it will be a boon for anyone who enters a lot of numeric data.
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The computer (ZX81 or spectrum) fits neatly inside. Also fitted inside the case is a mother board (81 model only) which allows 16K, 32K and 64K to be fitted in the case. All the connections are at the rear of the case i.e. Power Mic, Ear, T.V. and the expansion port. The power supply could also be fitted inside. This means you have a very smart self-contained unit.

NOTE
The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the Sinclair connectors. It is a simple two minute job and requires no electronic skills or any soldering.

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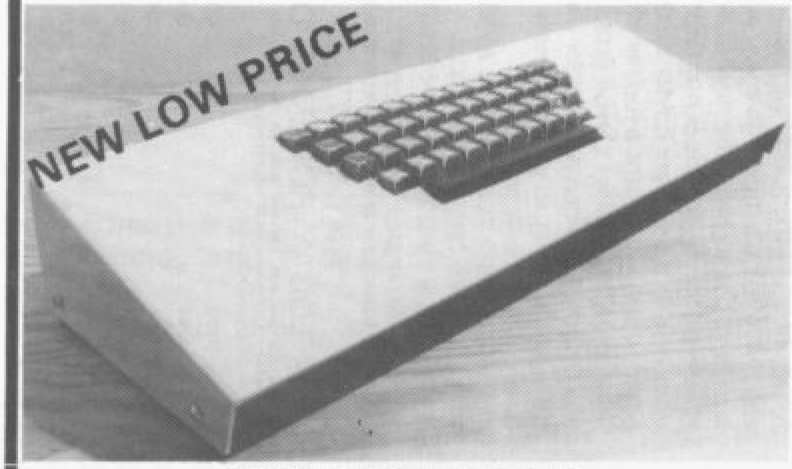
The DK Graphic module is our latest ZX81 accessory. This module unlike most other accessories fits neatly inside your computer under the keyboard.
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THE FOLLOWING SOFTWARE IS AVAILABLE FOR USE WITH THE GRAPHIC ROM
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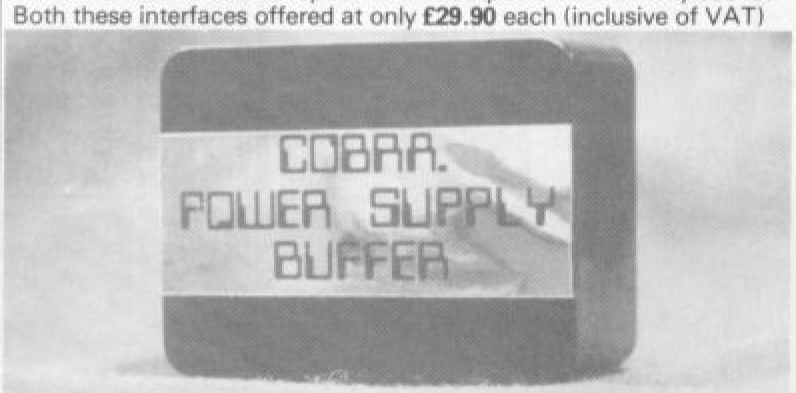
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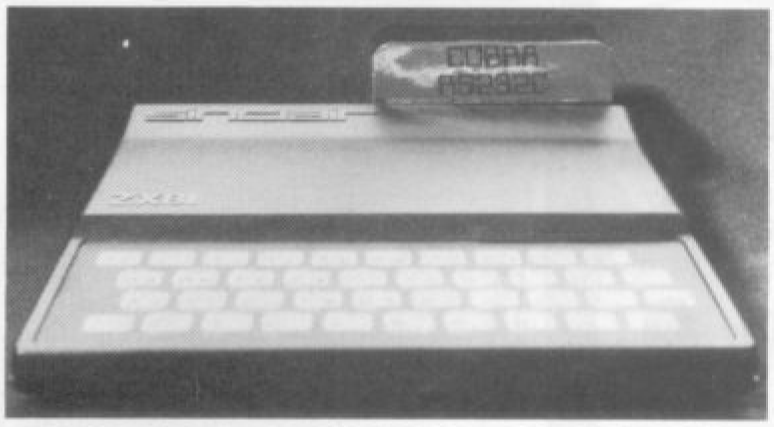
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The Cobra Power Supply Buffer prevents such occurrences.
It is fitted between the Sinclair power supply and the ZX81. During any loss of power to the ZX the buffer will continue to supply 9 volts to the computer for up to half an hour (with a fully charged battery). The unit will recharge itself during normal power conditions. When a mains loss situation occurs, a red light emitting diode will warn the user of loss of electricity supply.

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Design plans on the ZX-81

A CHARACTER generator is available for the ZX-81 for £19.95. It can be fitted beneath the keyboard or outside the ZX-81 and requires only four soldered connections to the printed circuit board.

A character generator is a device which allows you to design the character set you want to see — Space Invaders and lower-case letters being favourite examples. The characters are stored in RAM at 15872 so they can be PEEKd and POKEd.

A three-character REM statement is all that is required to exchange your characters for Sinclairs. The character board can be obtained from D Hutchinson, 103 Vicarage Wood, Harlow, Essex.

Loading aid from Fulcrum

A LOADING aid for ZX machines is available to help you find the correct level of your tape recorder. It consists of a small black box with two LEDs on top which will glow together when the correct level is reached.

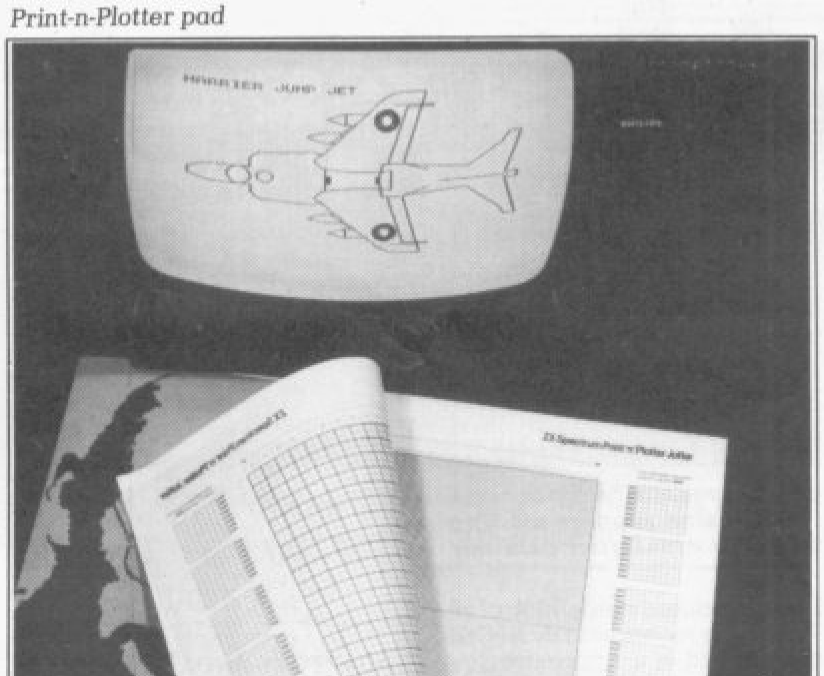
The device plugs into the EAR and power sockets of the computer with the power pack/tape leads plugging into its sockets. The loading aid is different for the ZX-80, ZX-81 and Spectrum, so specify when ordering. The loading aid is available at £11.95p from Fulcrum Products, Hillside, Steep Lane, Findon, Worthing, West Sussex BN14 0UF. Tel: 090-671 2750.

Plotting to improve colour

PRINT-N-PLOTTER has produced a plotter for the Spectrum so that you can transfer pictures from magazines to the TV screen, making the most of the more than 45,000 dots available. The pad has a set of seven coloured pens and has 50 pages of PRINT squares and 50 pages of hi-res squares to fill in.

Each page also contains six squares with which to design your own characters. A demonstration tape of what it can do is available for 60 pence. The Spectrum jotter is available from Print-n-Plotter Products, 19 Borough High Street, London SE1 9SE. Tel: 01-403 6644.

Print-n-Plotter pad



Improved tape control

ABACUS ELECTRONICS has improved its tape lead controller to work with the Spectrum. It uses a switch to disconnect the correct tape lead when SAVEing or LOADing, instead of having to pull out the plugs. It can also be used as an amplifier to produce BEEPs and keyboard clicks which are easy to listen to via a built-in loudspeaker.

The firm also produces a DIN plug version for use on tape recorders without 3.5mm. jack sockets.

The controller costs £14.95 from Abacus Electronics, 186 St. Helens Avenue, W. Glamorgan SA1 4NE. Tel: 0792-50282 or the Buffer shop in London.

Zon-81 gets itself heard

THE ZON-81 is a three-channel mono sound box which fits on the back of the ZX-81 and soon the Spectrum. It is a I/O device and contains its own loudspeaker and volume control. It can be programmed to give a wide range of sounds, from gunshots to an electronic organ.

There is also a noise generator included in the AY-3-8912 chip. The box is powered from the computer and is driven via two machine code routines — nine bytes in all. The cost of the unit is £25.95 from Bi-Pak, PO Box 6, 6 3A High Street, Ware, Herts. Tel: 0902-3182.

RAM is saved by Camel

IF YOU WANT a permanent way to store your programs but still change and correct them, why not try a Memic-81? It

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is a battery-backed RAM box which fits on the back of a ZX-81, so that when you switch off the computer the memory is not lost. It is also preserved during NEW and LOAD.

It is in two versions, 2K and 4K, but can be expanded to 8K by adding more chips. The RAM pack appears in the 8K-16K space on the memory map but can be moved to another area if desired.

The Camel products range also includes a 8-bit port and a 8K ROM/EPROM board. The price of the Memic-81 with 2K of RAM is £28.70; the 4K version costs £34.45, the port £14.95 and the ROM pack £17.19.

Camel products can be obtained from Cambridge Microelectronics Ltd, 1 Milton Road, Cambridge CB4 1 UY. Tele: 0223-314814.

Repeatable offer for ZX-81

A KEYBOARD REPEAT which works like that of the Spectrum on a ZX-81 will work with any keyboard, as it is soldered to the ZX-81 beneath the keyboard by nine wires. It is also small enough at 4cm. square to fit under the PCB if you already have something there.

Every key will auto-repeat if held down for more than a second, including the SHIFT keys, and if the soldering worries you the company will fit it to your ZX-81 for £2.50.

The Auto-Repeat (built) costs £5.50 inc. VAT and post from Kempston Electronics, 60 Adamson Court, Hillgrounds Road, Kempston, Beds. MK42 8QZ.

Bath design made easy

AN INGENIOUS device which suits anyone who needs to design their own characters is a plastic wallet with two 8 × 8 grids marked with numbers around the edge.

A set of magnetic black squares can be put on to the white squares and moved about without fear of them falling off. After a character has been worked-out the numbers of the squares can be fed into the computer to form each line of the character.

On the Spectrum they can be fed in as binary using the BIN function or on the ZX-81 using the decimal equivalents read from the pad.

The characters can be designed quickly and easily without having to have the computer on. They can also be designed in a car, bus or even in the bath. Two grids are included so that bigger designs can be made by using more than one character. The MCP can be obtained from MCP Co, 38 Woodside, Harrogate, North Yorkshire HG1 8NG for £2.95.

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*Please delete as appropriate. PLEASE PRINT.

Signature ________

Name: Mr/Mrs/Miss ________

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Hiding his light behind Sinclair

Jim Westwood has been with Clive Sinclair since his earliest days and still flinches at some of his ideas. Claudia Cooke speaks to him in Cambridge



ONE OF Jim Westwood's first pieces of engineering wizardry was the contraption which enabled him to carry-out soldering work from the comfort of his bed. Were it not for the fact that he was only 12 years old at the time, that might be mistaken for the sign of an extremely lazy character. As it is, it merely emphasises the trait of ingenuity which has helped him during his 20-year working relationship with Clive Sinclair.

During those two decades, he has had a hand in such innovative products as the Sinclair pocket calculator, the three more recent computers and the promised flat-tube TV, not to mention the transistor radios and hi-fi equipment of the early days.

Today, at 34, he is known as senior, or chief engineer, with Sinclair Research, a role which combines engineering and management skills.

> 'When you are working unconventionally I don't think training matters very much'

It is a far cry from the early 1960s when he joined Clive Sinclair and one secretary straight from school and relied on trial and error, as much as natural aptitude, to take him through his first days as a technician.

"Engineering of a kind was always my hobby, even when I was very young. Wherever I went you could be sure of finding a trail of broken torches in my wake. I had to take everything to pieces and gradually I was able to put it together again", he says.

It is that consistent, if unorthodox, philosophy which stood him in good stead for so many years and ensured that the products in which he had a hand were always at the forefront of technology.

"I think it must be unusual to find someone like me in a fairly senior position without formal training", he says modestly, "but when you are always working unconventionally, as we are at Sinclair Research, I don't think training matters very much. Aptitude is more important".

From his small office in Cambridge, surrounded by an orderly chaos of electronic equipment, he seldom works on fewer than three ideas at a time. Of those, few come to fruition and only a handful reach initial design stages.

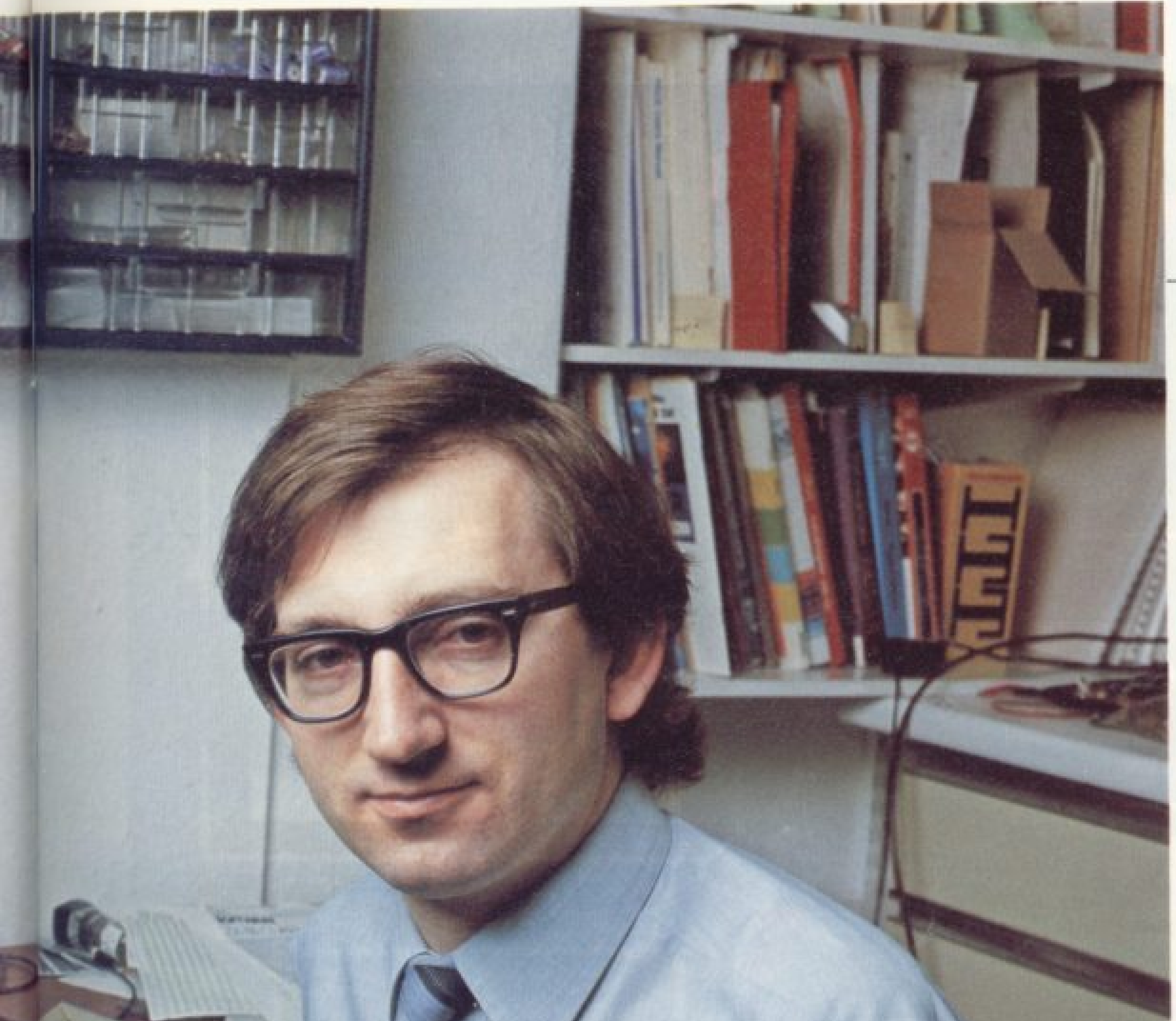
"The most difficult part is deciding what we want to achieve in the first place. We start with a mess which we call a breadboard. That has a very basic outline of our concept.

"All of us here have electronics in our bones and so when we first discuss an idea we know roughly its chances. Because we always produce 'firsts' we can be reasonably sure there will be no competition.

"The real worry is always whether it will catch on. You might feel sure there is a certain demand in the market but you are never sure just how it will sell".

Westwood admits that he still flinches at the sound of some of Clive's ideas but adds: "It's a challenge managing to achieve something without using expensive components and I like that challenge.

"Of all the products with which I have been involved I think the ZX-80 is my favourite. It was a real breakthrough in the use of cheap



components. It is something which ought to be in the Ark by now but I am still proud of it".

Westwood is a modest and unassuming man, dismissing his early role at Sinclair simply as a matter of "fiddling with the components and trying to get the thing working".

His confidence grows as he talks of Sinclair generally and it is clear that he recognises the combined talent in the company, a team which would be incomplete without him.

"We are always surprised at how long it takes the rest of the world to catch up with us. After working with Clive for years, you learn that it is worth trying to do things other than the straighforward way. It has amazing benefits. All our products show imagination and inventiveness; they make other people envy us and want to work for us.

"We spent a long time getting all the people together and now we have a very strong team, which is one of the main reasons for our success, in my view". Westwood, who is married to a former teacher and has four children under the age of 10, is adamant that his family will not be reared on a diet of TV games.

A seemingly bad advertisement, perhaps, for his work, but he is already introducing his children to the concept of computers as an aid to living — and they love it.

"My only adverse reaction to the whole thing is that the instruction manuals leave much to be desired when you are trying to teach children".

Aside from the sheer technology

'We are always surprised at how long it takes the rest of the world to catch up with us'

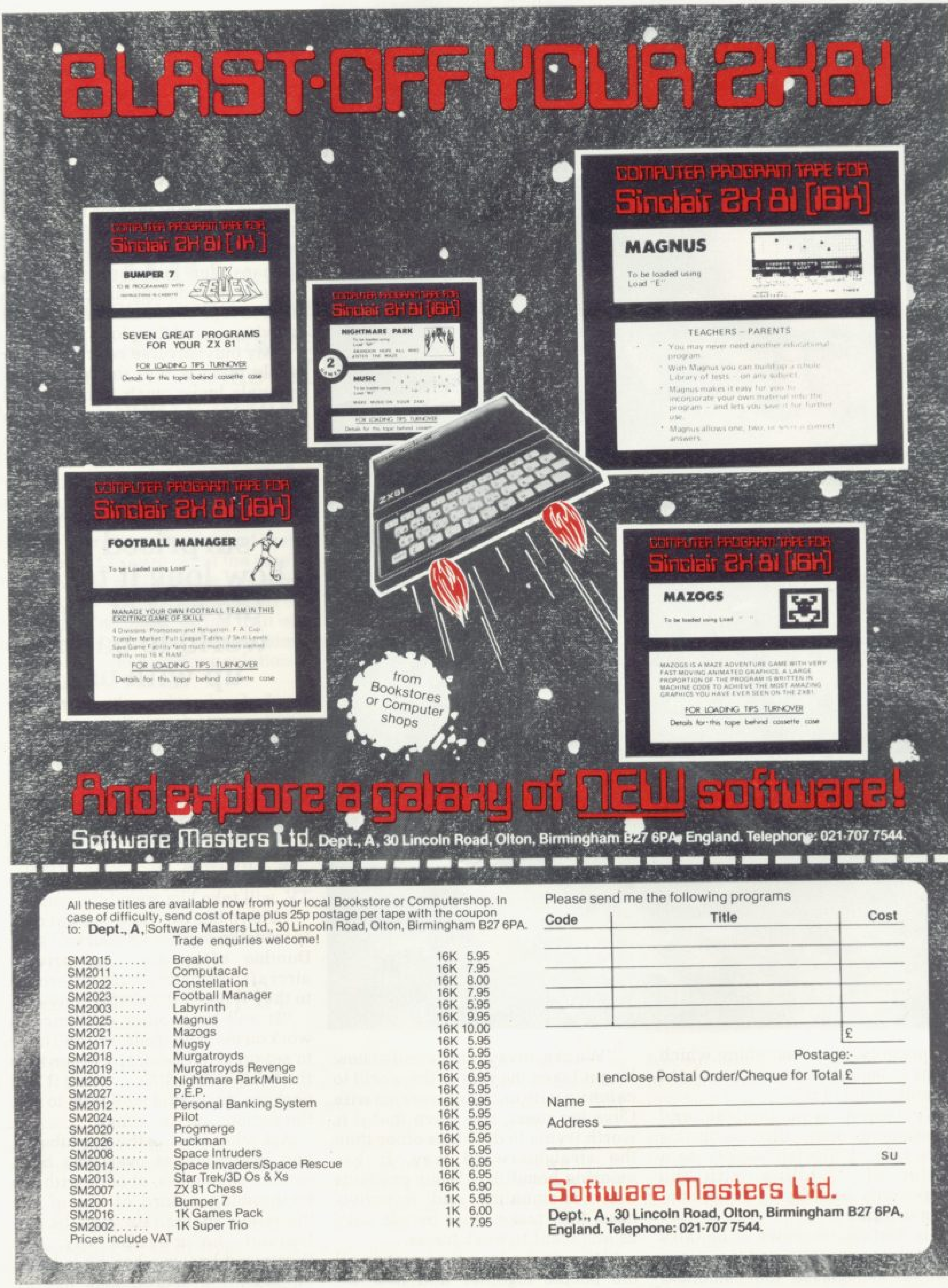
of his job, he has become involved increasingly in management, taking part in the decision-making and ensuring that ideas are carried through the system.

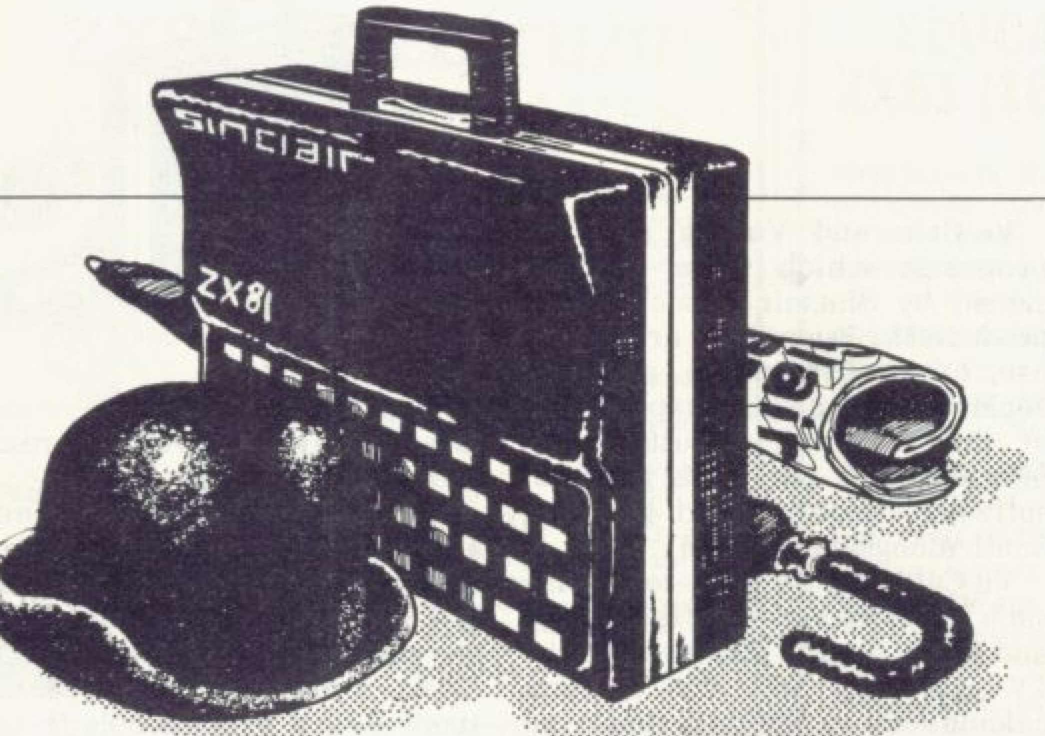
He enjoys decision-making and the follow-up process, including the field trials which, for the flat-tube TV, will take him round the world.

"There has not been a great deal fo travelling so far. Of course, I go to Dundee often and our private aircraft has made a huge difference to that; it beats the sleeper anyway.

"It will be another challenge to work on the field trials. We will have to set up small laboratories or take the equipment with us, trying it and perhaps modifying it slightly to suit the various surroundings".

Ask what follows the flat-tube TV and Westwood is overcome by a sudden vagueness, at odds with the forthcoming nature of the of the interview so far. He may be untrained, he may be shy, but Westwood knows when he is being tapped for a secret; and, like all good engineers, he is giving away nothing.


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John Gilbert looks at some examples in the growing library of business software

Easy ways of minding your own business

THE VARIETY of business software on the market for both ZX computers seems to be almost endless, as well as being confusing.

It is difficult for a beginner to decide which program is best for certain applications without becoming too involved with the technicalities of the business world. Business programs should teach the user who is also a beginner, as well as being an aid for the hardened businessman.

Hilderbay, run by Mike Salem, produces programs to cover a diverse area of business aplications which can be used in the home and at work. Salem stresses that the programs were made as simple as possible to use.

One program which would be useful to anybody interested in buying a house, taking a loan, or working-out VAT, is Financial Pack 1. The cassette has three programs on it — **Loan, Mortgage** and **VAT.**

Mortgage deals with bank and building society. It has two main uses. The first is seeing the effect of small changes in the mortgage rate on payments before deciding to take the mortgage. Second, it is possible to discover how much has to be paid in interest at the end of the month. The program will calculate either the term or the instalment of the mortgage, depending on what information is available at the time.

The loan program will compute any of the terms involved in loan repayment — principal, interest, number of instalments — depending on the other factors available.

With VAT you may enter prices with or without VAT. The program will display price, VAT totals, and VAT rate. Financial Pack 1 costs £5.

Another program from Hilderbay is **Budget.** The program will help the user to keep track of expenses incurred during the year. It is possible to keep expenses under 50 headings.

Information on each item of expenditure can be entered but only the monthly running totals are kept. The program will produce a bar chart of expenditure, budget plan, or difference between the budget plan and expenditure to date. The amount spent can be compared to the budget plan for the month. The program with data can be saved on tape in the usual way. Budget costs £5.

Finally from Hilderbay there is **Payroll.** The program will keep a record of employees and their pay for a small company. Payments can be entered on a weekly or monthly basis. After entering all the employee data and altering anything which needs to be changed, the program will calculate the present payroll.

The program includes a security routine which allows only a person who knows the correct code name to enter the program.

Investment on the stock market is becoming more and more popular. Micromega has produced a program which will keep track of the user's portfolio of stock and share investments. It is called **Comp-U-Share.** It monitors the most important factors measuring investment performance.

Once the relevant data is entered, it is possible to obtain reports on percentage gain and loss, price-earnings ratio, percentage nett gain or loss, and totals.

Records of shares can be indexed with numbers. When initiating a report it is possible to obtain an analysis of only those records which you desire by entering the relevant index numbers.

'Almost every application has been covered and the quality is high'

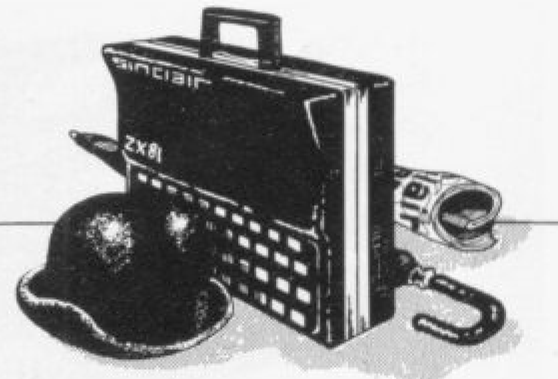
The program stores data files separately so that the user does not have to waste time storing both program and variables every time the program is used. It is also possible to verify the data stored on the tape in the same way as with the Spectrum. The program costs £9.95.

Micromega also produces a program to help with income tax. It may not decrease the amount paid

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but it can make the business of filling-in a tax form simpler. The program will run on both the 1K and 16K versions of the ZX-81. The 1K version is loaded in stages.

The **Income Tax** package is a mock-up of a tax form and a user guide which takes you through the business of filling-in a form with your tax data step by step. The program has been checked by chartered accountants and can be used for the tax year ending April 5, 1982. Income Tax costs £9.95 and there will be a 15 percent discount for updates.

Hestcrest provides a program called **Accounts** which will be of use to anyone preparing accounts from incomplete records. The program is menu-driven and when a client's income and expenses have been entered satisfactorily a profit-and-loss account and balance sheet can be displayed. It costs £17.50.

Vu-Calc and **Vu-File** are two programs which were commissioned by Sinclair Research and produced by Psion. They are easy to use, extremely flexible, and convenient for displaying expenditure at the press of a button. The programs are part of a group of software cassettes sold by W H Smith alongside the ZX-81.

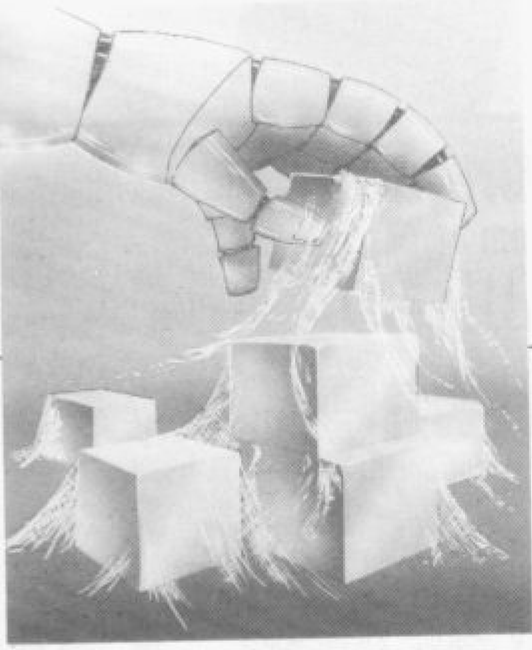
Vu-Calc can be used to display such items as income, expenditure and tax in a table displayed on the TV screen. It will also perform calculations on the data displayed from formulae entered to the table.

Vu-File can be used to store information such as club membership records, populations around the world, and time-tables. On the other side of the cassette is an example program which has instore information on every country in the world. Vu-File and Vu-Calc are available for £7.95.

All the programs mentioned are for use only on the ZX-81, except those from Hilderbay which are also available for the Spectrum.

Almost every business application has been covered during the last year and the quality of it is very high — surprisingly high for such a small machine as the ZX-81. It has been proved that the small system many people thought was of no use for serious applications is ar more versatile than they imagined.

Hilderbay, 8-10 Parkway, Regents Park, London NW1 7AA.
Micromega, 230-236 Lavender Hill, London SW11 1LE.
Hestacrest, PO Box 19, Leighton Buzzard, Beds LU7 0DG.
Sinclair Research, Stanhope Road, Camberley, Surrey GU15 3PS.





Mike Biddell answers some queries which have arisen from an earlier series.

Getting feedback on using machine code

I WOULD like to thank those who wrote concerning the three articles on Machine Code Programming. I like feedback. No-one as yet has claimed that the phoenix rose from the ashes. Did anyone manage to get the aircraft back off the runway?

Let us examine some of the difficulties expressed by readers so that you can look back at the three articles until the routines work satisfactorily. It is as well to mention that the programs are straight dumps from the ZX printer and work precisely as stated, so have patience and persevere.

A common difficulty expressed by readers was line 5 of the Machine Code Loader — page 49, May, 1982 *Sinclair User*. The line in question is:

5 LIST 1

The purpose of it is to list the program, including the REM statement, after each decimal code entry, so that you can see the code going into the REM statement. The Ms in the REM change to the graphic character corresponding to the number entered, or as a question mark if one does not exist. To show this in action, enter the machine code loader again and RUN it.

The program has run but all you will see happen is that the cursor changes from the K to the L mode. Some people were confused by this and assumed that the program had not run, or the system had crashed.

The reason that the program was designed this way was to allow the REM statement to be viewed as it changed with each code entered.

It is then possible to view the loader in action by entering the Sinclair graphic codes on page 181 of the Sinclair Manual. After each code, i.e., NEWLINE, 1 NEWLINE, 2 NEWLINE, you will see the appropriate characters appear, in turn, in the REM statement. It is not meaningful machine code, of course — it just demonstrates the loader in action.

To break out of the loader enter MM NEWLINE. You can then use POKE immediate, which was another source of misunderstanding. You can POKE immediate only if the cursor is in the K mode. Try it by entering:

POKE 16514,128 NEWLINE

Do not use a line number and you will see, when you get back the listing, that a large black square has appeared in the first position after the REM statement. At that point, you can play some interesting tricks using POKE immediate. Try this one:

POKE 16510,0

You will notice that the line number of the first line has changed from a one to a nought. Then enter 0 NEWLINE to try to delete it and, surprisingly, it will not delete — a useful way of ensuring that the valuable machine code in your REM statement is not deleted accidentally.

> 'Never pass a point which is puzzling you — understand as fully as you can'

Using POKE immediate it is also possible to make the listing disappear from the screen altogether, apart from "0 REM", as follows:

POKE 16514,118
POKE 16515,118

That tricks the ROM into believing the display file has terminated. The machine code loader is, of course, still in the program file and will still run. List 3 will confirm this. Then RUN.

A more complex point was raised by K Heath of Coventry. He noticed — see figure 2, page 49, June, 1982 *Sinclair User* — that step 13 of the scroll down programme (Ld A,(HL), decimal 126) had no equivalent graphic code in the REM statement, not even a question mark.

He is correct. The reason is that code 126 is used in the program file to tell the ROM that a number is terminated and as such cannot be given visual significance, so the ROM has been instructed not to translate code 126 into the display file.

You can verify this interesting fact by re-entering the machine code loader yet again and entering the following additional lines:

```
70 FOR I = 16514 TO 16554
75 PRINT PEEK I; "   ";
80 NEXT I
```

Those lines print-out the codes for the content of the program file and will indicate what is there. Now use POKE immediate:

POKE 16514,126

You will lose six bytes from the REM statement but you will see that nothing is displayed for code 126. You can confirm that it exists in the program file, i.e., from address 16514 onwards by using RUN 70.

The first code to be printed on the screen is 126, thus proving that address 16514 contains this value.

Computing is a very exact science; so the main tricks in studying it are never to pass a point which is puzzling until you understand as fully as you can and never make assumptions — always test at each point in a sequence.



Come to the ZX-81 with a clear mind to make the best use of your new machine.

A lifetime's obsession can easily be acquired

BUYING a ZX-81 can be the start of a lifetime obsession with home computing. It is easy,however, to become discouraged if everything does not go to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the ZX-81 is to abandon any ideas for special uses. While the basic machine is ideal for learning how to use computers, it is too small for any major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking the machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for a second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

Once the K appears you are ready to begin learning about the ZX-81. It can save family arguments if you can afford a separate television set for your system. It also makes life easier if you can find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads. The manual is written in great detail and is reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something which is important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are really ready but that is likely to lead to errors. For example, words like AND, THEN, and AT should not be typed-in letter by letter. By the time you have reached chapter 11, you should have accumulated sufficient knowledge to be able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important that when using the machine it is not jolted. Some of the connections can easily work loose and everything which has been put in will be lost.

The manual is not to everyone's taste and if you find it difficult to follow, a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing, you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy. There are some programs for the unexpanded 1K machine but most of them require a 16K RAM pack. The tapes vary in quality. It is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about the ZX-81 is to plunge in at the deep end and see what the computer will do. Refer to the manual when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machine.

You may have heard already about the problem involved in SAVEing and LOADing your own cassettes. The manual again gives detailed instructions but many of the early machines would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

They usually occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD" " followed by NEWLINE; then slowly increase the volume of the recorder with the tape running until the television screen shows four or five thick horizontal black bands. If you then re-wind the tape, the program should LOAD normally.

Finally, a health warning. Apart from any practical uses, computing with your ZX-81 can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning, thinking that in another five minutes you will sort out the problem.

Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a ZX-81 you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteen many happy hours with your Sinclair machine.





Humour invades the publishing market

John Gilbert reviews the latest books including the first for the Spectrum

THE MASS of ZX-81 books is still increasing. The author of the moment still seems to be Tim Hartnell. His new book for the ZX-81 is *Making The Most of Your ZX-81*. it will help beginners and contains many programs which can be typed-in immediately.

While the book is good for the complete beginner who has just read the manual, it is not recommended to anyone wanting to learn more about the capabilities of the ZX-81. The text just enlarges on the basic manual and the programs are mostly 1K long.

The book is humorous in places, either deliberately or unintentionally. For instance, one of the first programs is a simple game of **Russian Roulette**. The screen display is so simple but very amusing.

Making The Most of Your ZX-81, is available from Computer Publications and costs £6.95.

Another new book for the ZX-81 but with a slightly different format is *The ZX-81 Add-on Book*, by Martin Wren Hilton. It is remarkable for two reasons. First, it is one of the few books written about the hardware side of the ZX-81 market. It describes how extra memory can be added to the ZX-81, taking the Sinclair 16K RAM pack and the Audio Computers 32K RAM as examples.

Backing storage devices are also surveyed, including cassette tape decks and disc drives. Information about optical bar codes and modems is also included. The book explains the operation of the dK'tronics Graphic ROM and the Quicksilva Character Board. It also has a section about the future and the Sinclair miniature television.

The second remarkable thing is that the book is written by a 16-year-old. He has his own computer and writes for an American bi-monthly magazine. *The ZX-81 Add-on Book* is published by Shiva and costs £5.50.

Shiva has also published a book by Ian Stewart and Robin Jones, *Computer Puzzles — For Spectrum and ZX-81*.

The authors pose a series of problems, some old, some new, for which they have written programs to demonstrate the problems and to enable the user to try solutions quickly. The programs are interesting but when you solve one of them you have the same feeling you have when you have beaten someone in a game.

Also included is a Spectrum section for those lucky enough to have the machine. The price of the book is £2.50.

The quality of the books being written has improved with the advent of the Spectrum. For instance, *Programming your ZX Spectrum* is invaluable for people who could not find what they needed to know in the user manuals.

The book expands what is written in the manual and goes further by describing some of the things which have been omitted. It deals with coding of programs and also shows some of the techniques of structuring Basic programs.

The choice of programs has obviously been well thought out and they certainly show the capabilities of the machine.

One criticism is that it explains Basic statements like GOSUB and GOTO in too much detail. Other than that, it is a good book which is recommended for beginners. It is available from Interface and costs £6.95.

Over The Rainbow is a collection of programs in a softback which shows the potential uses of the Spectrum. Programs include games, utility routines and business programs. Some colour insets indicate some of the programs running. The book is from Melbourne House but seems over-priced at £6.95. That is not a criticism levelled only at Melbourne but at the whole computer publishing industry, which seem to trade on the belief that people will buy knowledge at any price.

> 'It is one of the few books written about the hardware side'

Computer Publications, Unit 3, 33 Woodthorpe Road, Ashford, Middlesex, TW15 2RP.
Melbourne House Publishers, Glebe Cottage, Glebe House, Station Road, Cheddington, Leighton Buzzard, Bedfordshire, LU7 7NA.
Interface Publications, 44-46 Earls Court Road, London, W8 6EJ.
Shiva Publishing, 4 Church Lane, Nantwich, Cheshire, CW5 5RQ.

Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power– personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

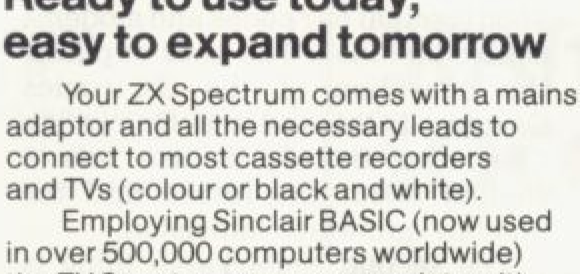
You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

rum



The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.



The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

The transfer rate is 16K bytes per second, with average access time of 3.5 seconds. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum.

All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.



RS232/network interface board

This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

ZX Spectrum

Available only by mail order and only from

sinclair

Sinclair Research Ltd,
Stanhope Road, Camberley,
Surrey, GU15 3PS.
Tel: Camberley (0276) 685311.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £ ______

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

SUS811

FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application.

PROGRAM PRINTOUT



PROBABILITY

POISSON'S FORMULA is a method of calculating the possibilities of the recurrence of an event, based on the number of occurrences in the past.

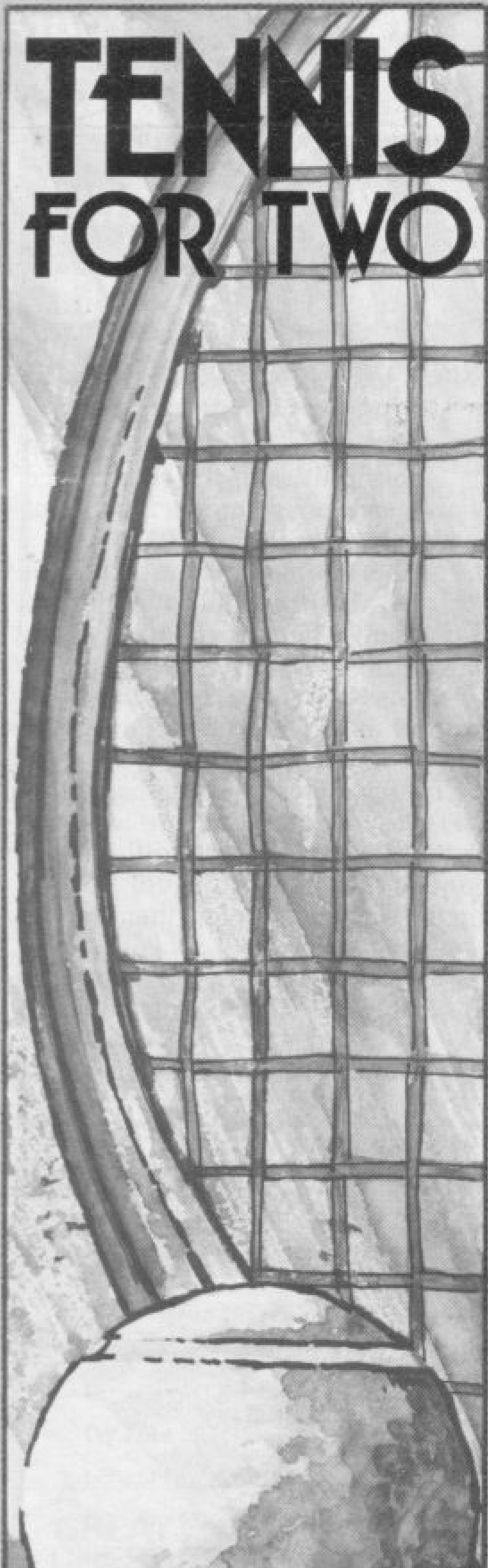
For this listing, the time should be adjusted so that the number of occurrences is in the range 3 to 12. The range could be extended upwards if required, but 2 has been omitted as it would mean an unreliably small sample.

The formula here is applied with a correction factor but that will not distort the results, since the same percentage is applied to all answers, thus keeping them in the same proportion.

Submitted by Eric Dobbie of Gainsborough, Lincolnshire, for the ZX-81.

```
   9 CLEAR
  10 PRINT "  LONG TERM PROBABIL
ITY STUDY"
  11 LET S=0
  12 LET T=0
  13 LET U=0
  14 LET V=0
  15 LET W=0
  16 LET X=0
  17 LET Y=0
  18 LET Z=0
  20 LET AA=0
  22 LET BB=0
  25 PRINT
  30 PRINT "INPUT THE MAXIMUM OC
CURRENCES IN ANY ONE UNIT OF TIM
E "
  31 PRINT
  32 PRINT "          RANGE ALLOWED
3 TO 12"
  40 INPUT A
  45 CLS
  50 PRINT "INPUT TOTAL OCCURENC
ES"
  60 INPUT B
  70 PRINT
  80 PRINT "INPUT TOTAL TIME"
  90 INPUT C
  95 CLS
 100 LET D=B/C
 110 LET E=(1+(1/B))**B
 120 LET F=1/(E**D)
 130 LET P=F
 140 LET Q=D*F
 150 LET R=D**2/2*F
 160 IF A>=3 THEN LET S=D**3/6*F
 170 IF A>=4 THEN LET T=D**4/24*
F
 180 IF A>=5 THEN LET U=D**5/120
*F
 190 IF A>=6 THEN LET V=D**6/720
*F
 200 IF A>=7 THEN LET W=D**7/504
0*F
 210 IF A>=8 THEN LET X=D**8/403
20*F
 220 IF A>=9 THEN LET Y=D**9/362
880*F
 230 IF A>=10 THEN LET Z=D**10/3
628800*F
 233 IF A>=11 THEN LET AA=D**11/
39916800*F
 237 IF A=12 THEN LET BB=D**12/4
79001600*F
 240 PRINT "PROBABILITY OF","PER
CENT"
 250 PRINT
 252 REM CORRECTION FACTOR
 255 LET N=P+Q+R+S+T+U+V+W+X+Y+Z
+AA+BB
 260 LET PP=(INT (P*10000/N+0.5)
)/100
 270 LET QQ=(INT (Q*10000/N+0.5)
)/100
 280 LET RR=(INT (R*10000/N+0.5)
)/100
 290 LET SS=(INT (S*10000/N+0.5)
)/100
 300 LET TT=(INT (T*10000/N+0.5)
)/100
 310 LET UU=(INT (U*10000/N+0.5)
)/100
 320 LET VV=(INT (V*10000/N+0.5)
)/100
 330 LET WW=(INT (W*10000/N+0.5)
)/100
 340 LET XX=(INT (X*10000/N+0.5)
)/100
 350 LET YY=(INT (Y*10000/N+0.5)
)/100
 360 LET ZZ=(INT (Z*10000/N+0.5)
)/100
 363 LET AAA=(INT (AA*10000/N+0.
5))/100
 366 LET BBB=(INT (BB*10000/N+0.
5))/100
 370 LET A$="0 OCCURRENCES"
 380 LET B$="1           """"""
 390 LET C$="2           """"""
 400 LET D$="3           """"""
 410 LET E$="4           """"""
 420 LET F$="5           """"""
 430 LET G$="6           """"""
 440 LET H$="7           """"""
 450 LET I$="8           """"""
 451 LET J$="9           """"""
 452 LET K$="10          """"""
 455 LET L$="11          """"""
 457 LET M$="12
 570 PRINT A$,PP,B$,QQ,C$,RR,D$,
SS,E$,TT,F$,UU,G$,VV,H$,WW,I$,XX
,J$,YY,K$,ZZ,L$,AAA,M$,BBB,,,,PP
+QQ+RR+SS+TT+UU+VV+WW+XX+YY+ZZ+A
AA+BBB
```

TENNIS FOR TWO



TENNIS FOR TWO is one of the few games for the 16K ZX-81 which can be played by two people. The display shows an aerial view of a tennis court. Player one controls his racquet with keys 1 and Z and attempts to drive the ball back across the net. If he misses — and the ball has a built-in wobble factor — he loses one of his three lives. Player two responds in kind, though he uses keys 0 and ".".

An interesting concept, though we found the randomised ball a little too difficult. Sent by A Mehmood, of Barking, Essex.

```
   4 LET N=3
   5 LET M=3
   6 LET H=0
   7 PRINT AT 0,0;"████████████████████
████████████████"
   8 PRINT AT 21,0;"███████████████
█PLAYER 2███████████████"
  10 LET D=0
  11 LET V=15
  12 LET X=INT (RND*20)+1
  15 LET S=0
  16 LET T=26
  17 LET I=10
  20 LET K=10
  21 FOR F=1 TO 20
  22 PRINT AT F,0;"█
█"
  23 NEXT F
  24 FOR F=1 TO 20
  25 PRINT AT F,15;"▒"
  26 NEXT F
  30 LET L=3
  40 PRINT AT K,L;"▓"
  41 PRINT AT K-1,L;" "
  44 PRINT AT K+1,L;" "
  45 PRINT AT 0,1;"SCORE";S
  46 PRINT AT X,V;"+"
  47 PRINT AT X,V;" "
  48 IF V=15 THEN PRINT AT X,V;"
▒"
  49 LET K=K+(INKEY$="Z")-(INKEY
$="1")
  51 IF K=X AND L=V THEN GOTO 90
0
  52 IF V<2 THEN GOTO 910
  53 LET V=V-1
  54 LET X=X+INT (RND*2)
  59 IF X=21 THEN LET X=2
  60 IF X=0 THEN LET X=19
 200 GOTO 34
 900 LET S=S+1
 901 PRINT AT 0,1;"SCORE";S
 905 GOTO 950
 910 LET M=M-1
 920 IF M<1 AND H>S THEN PRINT A
T 0,10;"[illegible]"
 925 IF M<1 THEN PRINT AT 21,1;"
LIVES 0"
 930 IF M<1 THEN STOP
 950 PRINT AT 21,1;"LIVES";M
 960 PRINT AT I,T;"▓"
 969 PRINT AT I-1,T;" "
 970 PRINT AT I+1,T;" "
 980 LET V=V+1
 990 LET X=X+INT (RND*2)
 991 IF X=20 THEN LET X=2
 995 IF X=0 THEN LET X=19
1005 LET I=I+(INKEY$=".")-(INKEY
$="0")
1006 PRINT AT X,V;"*"
1007 PRINT AT X,V;" "
1008 IF V=15 THEN PRINT AT X,V;"
▒"
1020 IF X=I AND V=T THEN LET H=H
+1
1029 PRINT AT 0,24;H;" SCORE"
1030 IF X=I AND V=T THEN GOTO 40
1035 IF X=I AND V=T THEN GOTO 40
1040 IF V>29 THEN GOTO 2000
1050 GOTO 960
2000 LET N=N-1
2001 PRINT AT 21,24;N;" LIVES"
2010 IF N<1 AND S>H THEN PRINT A
T 0,10;"[illegible]"
2015 IF N<1 THEN PRINT AT 21,24;
"0 LIVES"
2020 IF N<1 THEN STOP
2200 GOTO 40
```

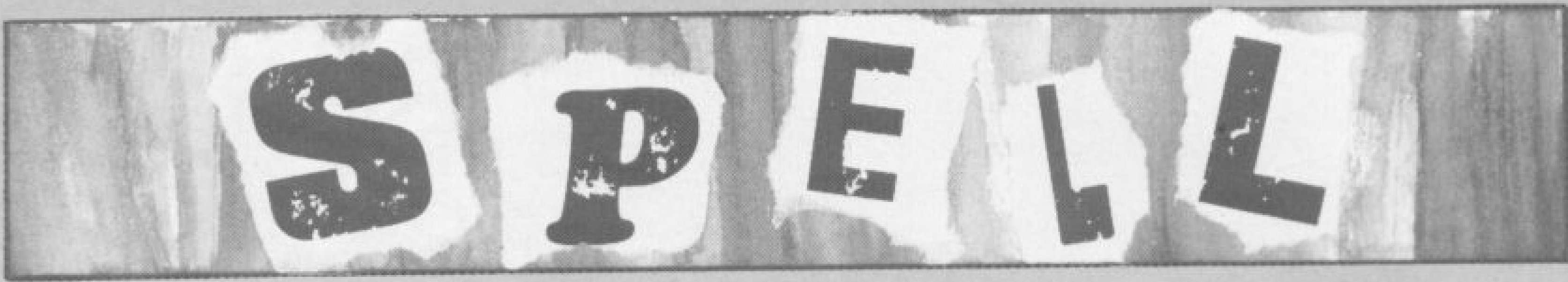
LINK FOUR is one of those games for people who prefer thinking to reacting. It is a version of a popular parlour game for two players which requires you to try to complete a line of four counters. Your opponent naturally will try to block your efforts and build his own line.

A diverting game for the expanded ZX-81 from R J Ross, of Clacton-on-Sea, Essex.

LINK FOUR



```
  10 PRINT "WOULD YOU LIKE A GAM
E OF          ""LINK-4""?"
  20 LET S$="0"
  30 INPUT C$
  40 LET A$="█"
  50 LET B$="▒"
  60 IF CODE C$=62 THEN PRINT "W
HO WILL BE PLAYING? ENTER       P
LAYERS SEPARATELY."
  70 INPUT M$
  80 INPUT N$
  90 PRINT M$;" = ";A$,N$;" = ";
B$,,,
 100 PRINT "THE OBJECT OF THE GA
ME IS TO GET4 COUNTERS IN A ROW
HORIZ./VERT./DIAG. BEFORE YOUR O
PPONENT, ANDTO CLAIM SAME BY ENT
ERING 0.",,,,
 110 DIM P(7)
 120 RAND
 130 LET K=INT (RND+.5)
 140 IF K=0 THEN GOTO 190
 150 PRINT A$
 160 LET L$=M$
 170 PRINT " HAS WON THE TOSS."
 180 GOTO 220
 190 PRINT B$
 200 LET L$=N$
 210 GOTO 170
 220 PAUSE 500
 230 CLS
 240 PRINT "IT IS THE TURN OF ";
L$
 250 PRINT AT 2,0;"ENTER COLUMN
NUMBER AND N/L"
 260 PRINT AT 5,4;"1 2 3 4 5 6 7
";AT 6,4;"-------------"
 270 INPUT X
 280 IF S$="*" THEN GOTO 540
 290 IF X=0 THEN GOTO 420
 300 IF P(X)>12 THEN GOTO 510
 310 PRINT AT 0,19;"
"
 320 IF K/2=INT (K/2) THEN GOTO
390
 330 PRINT AT 17-P(X),X*2+2;A$
 340 PRINT AT 0,18;N$
 350 LET P(X)=P(X)+2
 360 IF P(X)=12 THEN LET P(X)=10
0
 370 LET K=K+1
 380 GOTO 270
 390 PRINT AT 17-P(X),X*2+2;B$
 400 PRINT AT 0,18;M$
 410 GOTO 350
 420 PRINT AT 19,0;"THE GAME IS
CLAIMED AS WON"
 430 PAUSE 500
 440 PRINT "DO YOU WANT ANOTHER?
"
 450 INPUT C$
 460 IF CODE C$=62 THEN GOTO 110
 470 PRINT "THANK YOU. GOODBYE."
 480 STOP
 490 LET X=INT (RND*7)+1
 500 GOTO 310
 510 PRINT AT 19,0;"THAT COLUMN
IS FULL TRY ANOTHER"
 520 LET S$="*"
 530 GOTO 270
 540 LET S$="O"
 550 FOR I=0 TO 31
 560 PRINT AT 19,I;" "
 570 NEXT I
 580 GOTO 290
```




```
 10 REM "SPELL"
 20 DIM A$(10,10)
 30 DIM B$(1,10)
 40 PRINT "LIST 10 WORDS"
 50 FOR N=1 TO 10
 60 INPUT A$(N,1 TO 10)
 70 NEXT N
 80 PRINT "PRESS ""R"" WHEN YOU
ARE READY"
 90 INPUT R$
140 LET S=0
150 FOR N=1 TO 10
160 PRINT A$(N,1 TO 10)
170 PAUSE 100
180 CLS
190 INPUT B$(1,1 TO 10)
200 IF B$(1,1 TO 10)=A$(N,1 TO
0) THEN GOTO 250
210 LET S=S-1
220 PRINT "WRONG"
230 PAUSE 100
235 CLS
240 GOTO 160
250 PRINT "CORRECT"
260 LET S=S+1
270 PAUSE 100
280 CLS
290 NEXT N
300 IF S=10 THEN GOTO 330
310 LET S=0
320 GOTO 150
330 PRINT "ALL CORRECT"
340 PAUSE 200
350 CLEAR
360 GOTO 20
```

SPELL

WE HAVE a weakness for educational programs. **Spell** is a routine for the unexpanded ZX-81 which requires the student to copy correctly the spelling of a word which has been flashed briefly on to the screen.

The words are selected by the instructor and can be of any length; therefore they can be selected according to the age and ability of the child. The difficulty level could be adjusted further by altering the PAUSE in line 230.

The listing as printed is efficient but perhaps rather stark and might benefit from a few graphics to congratulate or commiserate, as appropriate.

Submitted by S Mosely of Peterborough.

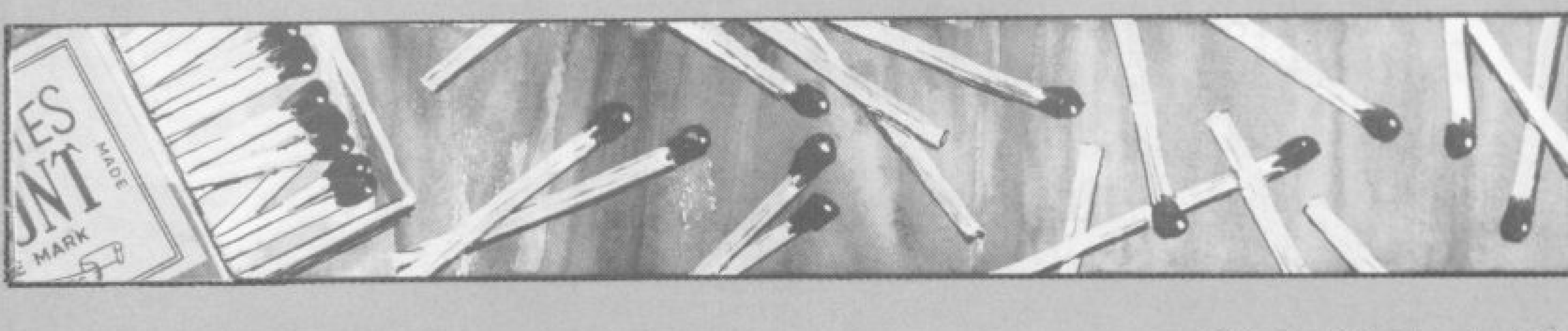
MATCHSTICKS

MATCHSTICKS is yet another version of the ubiquitous Last Matchstick game, the idea of which — as you and your grandmother and the family dog probably know already — is to make sure that you are not the one to take the last match.

The novelty of this listing is that it incorporates a tricky little routine which renders the computer unbeatable — very useful for impressing the non-Sinclair-owning friend.

Submitted for the expanded ZX-81 by M de Gentile Williams, of London W4.

```
 10 LET M=21
 15 FOR Z=1 TO 4
 20 PRINT "▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒"
 25 NEXT Z
 30 PRINT AT 4,5;" YOUR TAKE?
 "
 40 INPUT Y
 50 IF Y>3 OR Y<1 OR Y>M OR Y<>
INT Y THEN GOTO 40
 80 GOSUB 200
 85 IF M=0 THEN GOTO 300
 90 LET Y=4-Y
100 PRINT AT 4,5;" MY TAKE IS:
";Y;
104 FOR Z=1 TO 50
105 NEXT Z
110 GOSUB 200
120 GOTO 30
200 FOR F=M TO M-Y STEP -1
212 FOR Z=0 TO 3
215 PRINT AT Z,F;" "
217 NEXT Z
220 NEXT F
230 LET M=M-Y
235 PRINT AT 4,7;" MATCHSTICKS"
240 RETURN
300 PRINT AT 4,6;" I HAVE WON"
```

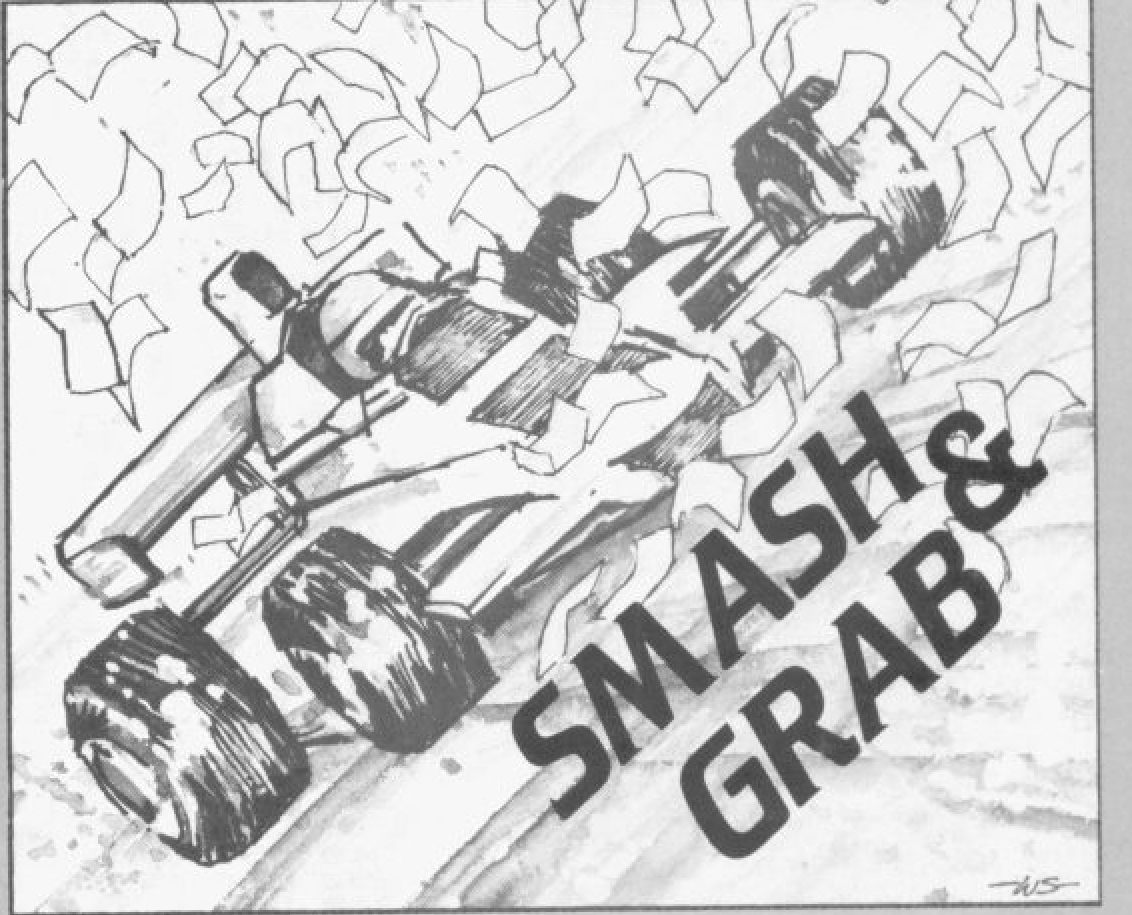


ELBOWS were flying in front of the office keyboard, jostling to try **Smash and Grab**, an annoyingly addictive game for the 16K ZX-81. Superficially it is like a thousand other games. You are driving around an obstacle-filled arena, scoring for every £ you can hit and losing one of your five lives for every collision.

The snag is that your vehicle travels only in circles or at tangents, depending whether or not the 5 or 8 key is being pressed.

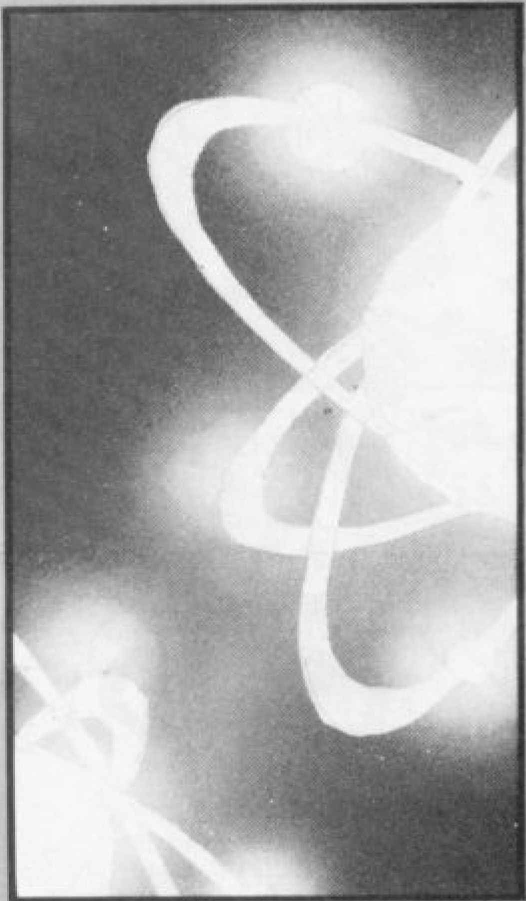
Clear all the £s from one sheet and you can play again with double the number of obstacles to avoid. There is a name and high-score routine to tempt your ambition.

The sender of this diverting game, Peter Wylie, of Christchurch, Dorset, boasts a personal best score of £5,000. Your reviewer could do nothing to rival that.




```
   1 REM --------------------
   2 REM >>>>SMASH,N,GRAB<<<<
   3 REM ))))------------((((
   4 REM >>>>BY P.A.WYLIE<<<<
   5 REM --------------------
   8 LET H=0
   9 LET L=5
  10 LET S=0
  14 PRINT AT 20,2;"SCORE=£0";AT
 20,15;"HIGH SCORE=£";H
  15 PRINT AT 21,0;"██████████
████████████████████████████████"
  20 FOR Z=0 TO 19
  25 PRINT AT 21,0;"█";AT 21,31;
"█"
  30 SCROLL
  35 NEXT Z
  40 PRINT AT 21,0;"██████████
████████████████████████████████"
  80 FOR X=1 TO 20
  90 LET R=INT (RND*19)+2
 100 LET T=INT (RND*30)+1
 111 PRINT AT R,T;
 112 LET M=PEEK (PEEK 16398+256*
PEEK 16399)
 113 IF M=12 OR M=126 OR R=10 OR
R=9 OR R=11 THEN GOTO 90
 120 IF X<=10 THEN PRINT AT R,T;
"█"
 130 IF X>10 THEN PRINT AT R,T;"
£"
 140 NEXT X
 150 LET N=0
 160 LET A=10
 170 LET B=15
 180 LET P=1
 190 PRINT AT A,B;
 200 LET M=PEEK (PEEK 16398+256*
PEEK 16399)
 210 IF M<>0 THEN GOTO 9000
 230 PRINT AT A,B;"O"
 250 LET P=P+(INKEY$="8")-(INKEY
$="5")
 270 IF P=0 THEN LET P=8
 280 IF P=9 THEN LET P=1
 290 PRINT AT A,B;" "
 300 LET B=B+(P=1 OR P=2 OR P=8)
-(P=4 OR P=5 OR P=6)
 320 LET A=A+(P=2 OR P=3 OR P=4)
-(P=6 OR P=7 OR P=8)
 340 GOTO 190
2000 LET L=L-1
2005 PRINT AT A,B;"█"
2010 IF L=0 THEN GOTO 4000
2015 PRINT AT 10,12;"LIVES=";L
2020 FOR F=1 TO 30
2030 NEXT F
2040 PRINT AT 10,12;"
2050 PRINT AT A,B;"█"
2060 LET P=P+(4 AND P<=4)-(4 AND
 P>4)
2070 GOTO 300
3010 PRINT AT 9,7;"COMPLETED SHE
ETS=";S/1000
3160 PRINT AT 11,12;"LIVES=";L
3200 FOR Z=0 TO 75
3300 NEXT Z
3400 PRINT AT A,B;" "
3450 PRINT AT 9,7;"

3460 PRINT AT 11,12;"
3500 GOTO 80
4000 LET A$="GAME OVER"
4100 FOR C=1 TO 9
4200 FOR D=1 TO 4
4300 NEXT D
4400 PRINT AT 10,C+10;A$(C)
4500 NEXT C
4800 FOR Z=0 TO 21
4950 IF S>=H THEN PRINT AT Z,0;"
████████████████████████████████"
4960 IF S<H THEN SCROLL
5000 NEXT Z
5010 IF S>H THEN LET H=S
5020 IF S<H THEN GOTO 5100
5021 PRINT AT 7,11;"[illegible]"
5022 PRINT TAB 4;"[illegible]
[illegible]"
5023 PRINT TAB 12;"[illegible]"
5024 PRINT TAB 11;"[illegible]"
5025 LET B$=""
5026 LET M$=""
5030 INPUT T$
5031 LET B$=B$+STR$ H
5032 FOR Y=1 TO LEN B$
5033 LET M$=M$+CHR$ (CODE B$(Y)+
128)
5034 NEXT Y
5040 FOR J=0 TU 21
5050 SCROLL
5060 NEXT J
5070 GOTO 5250
5100 PRINT AT 7,8;"YOUR SCORE=£"
;S
5200 PRINT AT 9,6;"HIGH SCORE £"
;B$
5210 FOR B=0 TO 5
5220 NEXT B
5250 PRINT AT 9,6;"[illegible]"
;M$
5255 FOR B=0 TO 5
5256 NEXT B
5460 PRINT AT 11,8;"SET BY ";T$
5500 IF INKEY$="" THEN GOTO 5200
5700 GOTO 9
9000 IF M=12 THEN GOSUB 9600
9200 IF M=128 THEN GOTO 2000
9300 PRINT AT A,B;"O"
9400 IF N=10 THEN GOTO 3000
9500 GOTO 250
9600 LET N=N+1
9605 PRINT AT A,B;"█"
9610 LET S=S+100
9620 PRINT AT 0,9;S
9630 RETURN
9900 SAVE "SMASH,N,GRA█"
9910 RUN
```



RADIO ACTIVE DECAY

THIS PROGRAM simulates the random decay of atoms. When run, it displays 256 atoms and a bar chart; as one atom decays, a new one is born. The bar chart keeps a record of the number of mother and daughter atoms. Every decay is also marked by a burst of sound. The rate should slow if the decay is random.

Following the decay of the final atom you are asked to guess the half-life of the atom. Your standing as a nuclear scientist is then analysed and you are told how close you were to the answer.

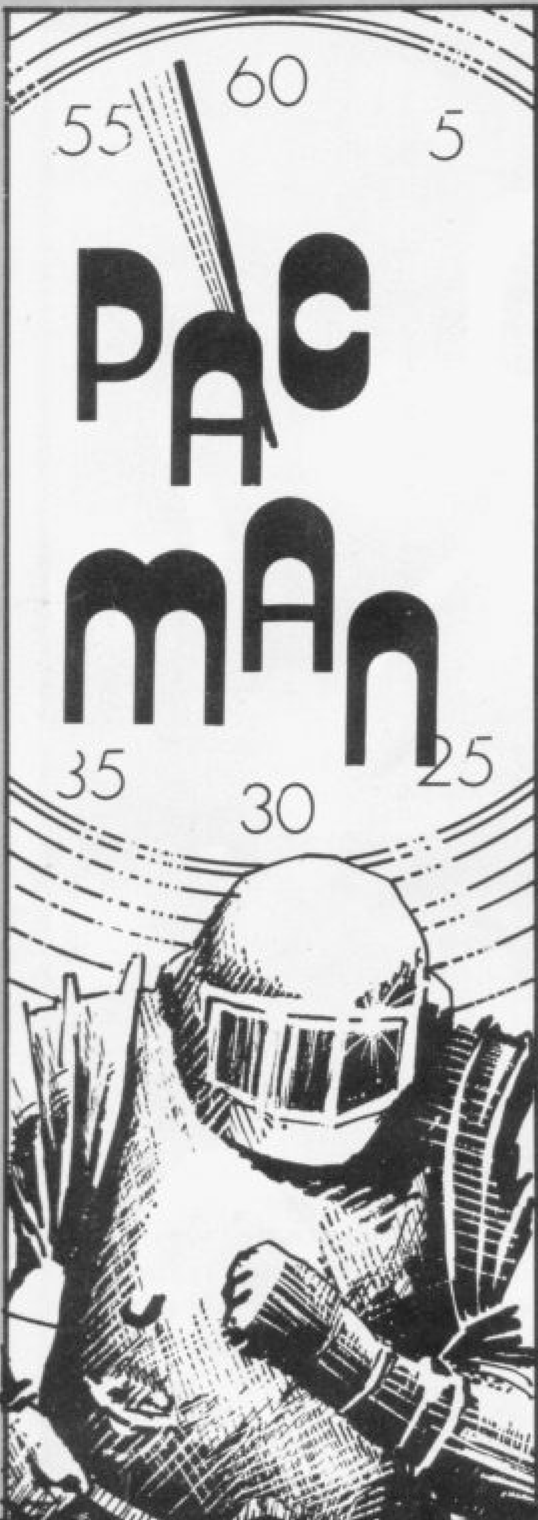
Radioactive Decay was sent by D Noonan, of London N8.

```
  10 CLEAR 32499
  20 BORDER 7: PAPER 7: CLS
  30 PRINT AT 0,1; PAPER 5; INK
0;"RADIOACTIVE DECAY SIMULATION"
  40 LET y=3
  50 FOR x=1 TO 18: PRINT AT y,x
; INK 3;"■": NEXT x
  60 LET y=20
  70 FOR x=1 TO 18: PRINT AT y,x
; INK 3;"■": NEXT x
  80 LET x=1
  90 FOR y=4 TO 19: PRINT AT y,x
; INK 3;"■": NEXT y
 100 LET x=18
 110 FOR y=4 TO 19: PRINT AT y,x
; INK 3;"■": NEXT y
 120 FOR x=2 TO 17
 130 FOR y=4 TO 19
 140 PRINT AT y,x; INK 7; PAPER
1;"#"
 150 NEXT y
 160 NEXT x
 170 DIM m(100)
 180 LET a=0
 190 INK 0: PLOT 175,144: DRAW 0
,-129: DRAW 64,0
 200 FOR y=4 TO 19: PRINT AT y,2
3; INK 1;"■": NEXT y
 210 PRINT AT 2,1; INK 2;"TIME";
AT 3,21; INK 1;"#";AT 3,25; INK
2;"!";AT 21,0; PAPER 6; INK 0;"P
ress G to see a graph of decay"
 220 LET mother=256
 230 LET daughter=0
 240 LET time=0
 250 LET r=INT (4*RND)
 260 LET x=2+(r+15)*RND
 270 LET y=4+15*RND
 280 IF ATTR (y,x)=15 THEN LET m
other=mother-1: LET daughter=dau
ghter+1: BEEP 0.1,50*RND: PRINT
AT y,x; PAPER 4+r; INK 2; BRIGHT
 1;"!": GO TO 300
 290 PAUSE 4: PRINT AT y,x; OVER
 1; BRIGHT 1; PAPER 8; INK 8;" "
 300 PAPER 7: INK 1: PLOT INVERS
E 1;184,mother/2+16: DRAW INVERS
E 1;7,0
 310 INK 2: PLOT 208,daughter/2+
15: DRAW 8,0
 320 PRINT AT 3,22;"    "
 330 PRINT AT 3,22; INK 1;mother
;AT 3,26; INK 2;daughter
 340 LET time=time+1
 350 PRINT AT 2,6; INK 2;INT (ti
me/3)
 370 IF time/12=INT (time/12) TH
EN GO SUB 410
 380 IF PEEK 23560=103 THEN PRIN
T AT 21,0;" Please wait it's com
ing soon  ": GO TO 580
 390 IF mother=0 THEN GO TO 450
 400 GO TO 260
 410 LET a=a+1
 420 IF a>100 THEN RETURN
 430 LET m(a)=INT (mother/2+.5)
 440 RETURN
 450 RESTORE 460: PRINT AT 21,0;
"
  "

 460 DATA 33,0,88,17,0,3,14,150,
113,35,27,122,179,32,249,201
 470 FOR f=1 TO 16
 480 READ a: POKE 32500+f,a: NEX
T f
 490 RANDOMIZE USR 32501
 500 BORDER 2
 510 PAUSE 300
 520 DATA 1,9,1,10,1,14,1,12,0.5
,10,0.5,9,1,7,1,0,1,5,1,7,1,9,.5
,10,.5,9,2,7
 530 RESTORE 520
 540 FOR f=1 TO 14
 550 READ d,n
 560 BORDER INT (n/2)
 570 BEEP .25*d,n: NEXT f
 580 FOR g=1 TO 1000
 590 NEXT g
 600 BORDER 7
 610 DATA 0,0,0,0,128,128,128,12
8
 620 RESTORE 610
 640 FOR f=0 TO 7
 650 READ u: POKE USR "a"+f,u
```

```
 660 NEXT f
 670 CLS : RESTORE 690
 680 INK 1: PRINT AT 0,5;"Graph
to show decay"
 690 DATA " 0"," 40"," 80","120"
,"160","200","240","280","N","o"
,".","o","f"," ","a","t","o","m"
,"s"
 700 FOR y=17 TO 3 STEP -2
 710 READ g$: PRINT AT y,1;g$;"-
": NEXT y
 720 FOR y=4 TO 14: READ a$: PRI
NT AT y,0;a$: NEXT y
 730 FOR x=5 TO 30 STEP 5
 740 PRINT AT 17,x;"; ";AT 18,x-1
;16*(x-5): NEXT x
 750 PRINT AT 19,7;"Time(seconds
)"
 760 PLOT 40,152: DRAW 0,-117: D
RAW 204,0
 770 FOR a=1 TO 100
 780 PLOT 40+2*a,.8*m(a)+36
 790 NEXT a
 800 DEF FN s(t)=256*EXP (-k*t)
 810 INPUT "Guess half life in s
econds ";h
 820 PRINT AT 2,10;"Score=      ";
AT 3,6;"
"
 830 LET point=0
 840 LET k=0.693/h
 850 FOR t=4 TO 400 STEP 4
 860 IF POINT (40+.5*t,.4*FN s(t
)+36) THEN LET point=point+1
 870 PLOT 40+.5*t,.4*FN s(t)+36
 880 NEXT t
 890 DATA "I'm speechless","Plea
se examine your brain","Clever d
ick","You need positive vetting"
 900 PRINT AT 2,16;point;"%";AT
3,6;
 910 FLASH 1
 920 RESTORE 890: READ a$,b$,c$,
d$
 930 IF point=0 THEN PRINT a$
 940 IF point>0 AND point<30 THE
N PRINT b$
 950 IF point>=30 AND point<=60
THEN PRINT c$
 960 IF point>60 AND point<=100
THEN PRINT d$
 970 FLASH 0
 980 PRINT AT 21,0;"Press R to r
un"
1000 IF INKEY$="r" THEN GO TO 10
20
1010 GO TO 1000
1020 PRINT AT 21,0;"Would you li
ke to know more Y/N?"
1030 IF INKEY$="y" THEN GO TO 10
60
1040 IF INKEY$="n" THEN RUN
1050 GO TO 1030
1060 BORDER 0: PAPER 0: CLS : PR
INT PAPER 6; INK 0;"Radioactive
decay simulation          "
1070 PRINT : INK 3: PRINT " Thro
w aside your inhibitions": PRINT
 " and become a nuclear physicis
t!"
1080 PRINT : INK 6: PRINT "Your
research team have amazing,exclu
sive video film of the"
1085 PRINT "radioactive decay of
 256# atoms"
1090 PAUSE 50: PRINT : INK 5: PR
INT "These 'mother' atoms become
 new"
1095 PRINT " !'daughter' atoms"
1100 PRINT : INK 4: PRINT " Use
your observational powers"
1110 PRINT "to deduce the half l
ife: the "
1120 PRINT "time it takes for ha
lf the atoms remaining at any st
age to decay"
1130 PRINT : INK 6: PRINT "A gra
ph of the results plotted"
1140 PRINT "will help but the te
st is severe"
1210 PRINT : PRINT INK 7;"Press
any key to run"
1220 PAUSE 4e4
1230 RUN
```





THIS is a **Pacman** game without the ghosts. Your task is to consume as many food pellets as possible in the given time. The display is excellent, though a race against time is obviously less exciting than a race against a ghoulish death.

The Pacman is manoeuvred right with key 0, left with 8, up with Q and down with Z. Dots are worth one point and asterisks 10. You have one minute 15 seconds to eat as much as possible.

The program was submitted by John Watkins, of Andover, Hampshire, for the 16K ZX-81. He reports a top score of 267. Perhaps a reader can conjure a little of the supernatural to add to this routine.

```
  10 REM      ████████████
  20 REM      █ PAC-MAN 3 █
  30 REM      ████████████
  40 REM
  50█REM █PRINT MAZE█
  60 PRINT "████████████████████████████
█████"
  70 PRINT " █....█.*.PAC█.*.█..
..█"
  80 PRINT " █.*█.█.█.█MAN.█.█.█
*.█"
  90 PRINT " █.██.█.█......█.█.█
█.█"
 100 PRINT " █....█.█.█..█.█.█..
..█"
 110 PRINT " ████.██...█..█...██.
████"
 120 PRINT " █..................
..█"
 130 PRINT "██.██.█*.██  ██.*█.█
█.███"
 140 PRINT "......██.█   █.██..
...."
 150 PRINT "██.█.....█████████.....
█.███"
 160 PRINT " █.█.███.█....█.███.
█.█"
 170 PRINT " █.....█...██...█...
..█"
 180 PRINT " █.█.█*█.█....█.█*█.
█.█"
 190 PRINT " █.█...█.██..██.█...
█.█"
 200 PRINT " █...███.█*..*█.███.
..█"
 210 PRINT " ██.██...█.██.█...██
.██"
 220 PRINT " █.....█.........█...
..█"
 230 PRINT " █*█.█.█.█.██.█.█.█.
█*█"
 240 PRINT " █...*.█.*.██.*.█.*.
..█"
 250 PRINT " ██████████████████████
████"
 260 REM [illegible]
 270 POKE 16437,128+1.25*12
 280 LET SCORE=0
 290 LET A=3
 300 LET B=10
 310 PRINT AT A,B;" "
 320 LET D=A
 330 LET E=B
 340 LET A=A+(INKEY$="Z")-(INKEY
$="Q")
 350 LET B=B+(INKEY$="0")-(INKEY
$="8")
 360 PRINT AT A,B;
 370 LET C=PEEK (PEEK 16398+256*
PEEK 16399)
 380 IF C>=128 THEN LET A=D
 390 IF C>=128 THEN LET B=E
 400 IF C=23 THEN LET SCORE=SCOR
E+10
 410 IF C=27 THEN LET SCORE=SCOR
E+1
 420 IF B=24 THEN LET B=0
 430 IF B<0 THEN LET B=24
 440 PRINT AT A,B;"C"
 450 IF PEEK 16437=128 THEN GOTO
 470
 460 GOTO 310
 470 PRINT AT 15,24;"[illegible]",TAB
25;SCORE
 480 STOP
```

Something old, something new

the first sinclair user annual

The complete guide to the last year of Sinclair computers

The world of Sinclair computers is fast-moving, with new developments almost daily. During the months since its launch in April, *Sinclair User* has attempted to keep you up-to-date with all that has been happening.

Now, however, we feel it is time to take stock of what has been happening during those months. So we have decided to publish *The First Sinclair User Annual.*

We have asked all our top writers to give their impressions of the last 12 months and chosen the best articles and programs from past issues.

It will allow you to keep abreast of some of the things you may have missed and to assimilate the changes which have overtaken all of us so quickly.

The First Sinclair User Annual will be available from all the usual newsagents, price £1.50, from the beginning of December.

Order your copy now to avoid being disappointed.





Scottish schoolboy wins printer and 64K Memopak for system which stores and sorts examination results, based on an idea from one of his teachers

Education theme for winning 48K program

FINDING a practical use for the ZX-81 in education was the basis for the winning entry in our July competition. We asked for a program which would require 48K of RAM and David Stevenson used it for storing and sorting examination results. His program, which we list, wins him a Sinclair ZX printer and a 64K Memopak.

Sixteen-year-old Stevenson said that the idea for the program was provided by one of his masters at Stranraer Academy, where he is now studying for his highers.

"I was talking to one of the masters and he said that he wanted a program to sort examination results, so I set out to write it, partly at home and partly at school," says Stevenson, of Fairmile, Brookfield Crescent, Stranraer.

The program uses a machine code routine, which is entered at the beginning, to do the sorting and allows about 350 names and information to be entered in 16K, or more than 1,000 in 48K. It is menu-driven with six options — reading

continued on page 52

```
   0 REM /?5GN ?
5377 RND5 RNDY M RNDUM RNDTAN U
RND RETURN "4 E RND76 RND/2 GOSU
B ? RND? RETURN  4 INT ,Y REM E
RND GOSUB  5 RNDY"  4 REM 76 RND)
 RNDY" C <7( RAND INT ;?M RND
GOSUB ? RND76 RND RND?VAL LN  RN
DAT ( RAND U RND?  LN ?"TAN XXXX
XXXXXXX
  10 REM [illegible]
  20 REM [illegible] STEVENSON [illegible]
  30 REM [illegible]
  40 LET E=25
  50 LET N$="MARK DATA"
  60 GOSUB 1700
  70 REM [illegible]
  80 REM "FAYRE JOHN,4B,100.""CA
MPBELL DOUGLAS,4A,45.""HENDERSON
 ALAN,4C,67.""SERVICE JOHN,4F,99
.""KENNEDY BRYAN,4E,96.""STEVENS
ON DAVID,4F,35.""MILROY GEORGE,4
C,87.""GREIVE ROBERT,4E,78.""STE
VENSON MICHAEL,4F,93.""LOGAN STU
ART,4B,67.""MCMANUS MARK,4B,56."
"SHANKS LAWRI,4F,23.""COOPER JOH
N,4A,45.""ANDREWS EDWARD,4A,09."
  90 REM "BUCHANAN ANGUS,4A,75."
"MCINTYRE JAMES,4F,34.""DOWNIE C
OLIN,4B,34.""NEWEL MARK,4E,12.""
ALISON DAVID,4A,34.""SHARP JOHN,
4F,48.""SHARP GRAHAM,4F,56.""SMI
TH GAVIN,4F,78.""MCKEAND TONY,4D
,90."
 100 REM "FENTON DAVID,4C,98.""A
LEXANDER ROSS,4E,56."
 110 REM X
 120 REM X
 130 REM X
 140 REM X
 150 REM X
 160 REM X
 170 REM X
 180 REM X
 190 REM X
 200 REM X
 210 REM X
 220 REM X
 230 REM X
 240 REM X
 250 REM X
 260 REM X
 270 REM X
 280 REM X
 290 REM X
 300 RAND USR 16521
 310 DIM A$(E,32)
 320 LET A=PEEK 16396+256*PEEK 1
6397
 330 FOR D=1 TO E
 340 RAND USR 16514
 350 FOR B=1 TO 32
 360 LET C=PEEK (B+A)
 370 IF C=27 THEN GOTO 410
 380 LET A$(D,B)=CHR$ C
 390 NEXT B
 410 CLS
 420 NEXT D
 430 GOTO 1040
 540 REM [illegible]
 550 REM * A$(D) CONTAINS [illegible]
[illegible] PADDED OUT TO 32
CHARACTERS WITH SPACES
 560 GOSUB 1700
 610 LET C=0
 620 FOR G=1 TO E
 630 LET X=0
 640 FOR H=1 TO 32
 650 LET X=X+(A$(G,H)=",")
 660 IF X=2 THEN GOTO 760
 670 NEXT H
 680 LET C=C+A
 690 IF PEEK 16442=3 THEN CLS
```





continued from page 51

the files; working-out the average mark; sorting and displaying in alphabetical order and order of merit: amending the files; and storing them on tape.

On each entry there is room for the name, the class and the mark for a particular examination.

Stevenson's interest in computers began about two years ago when the school started a computer club with a Commodore Pet. The club now has five Pets and one ZX-81.

In the last year he has tended to use the Sinclair machine more than the Pet. He has a ZX-81 at home and also prefers the version of Basic and thinks the system of syntax errors makes it easier to use.

"After taking my highers I hope to go to university to study computer science and hope to be able to take an O level in computing before I leave," he adds.

```
700 NEXT G
710 LET A=C/E
720 SLOW
730 PRINT ,"AVERAGE=";INT ((A+.5)*10)/10
740 GOTO 1930
760 LET A=VAL (A$(G,H+1 TO H+4))
770 PRINT A,
780 GOTO 680
790 REM [illegible]
800 GOSUB 1970
860 FOR N=2 TO E
870 CLS
880 IF A$(N-1)>A$(N) THEN GOSUB 910
890 NEXT N
900 GOTO 950
910 LET Z$=A$(N-1)
920 LET A$(N-1)=A$(N)
930 LET A$(N)=Z$
940 RETURN
950 FOR N=2 TO E
960 IF A$(N-1)>A$(N) THEN GOTO 860
970 NEXT N
980 GOTO 1800
1040 FAST
1045 CLS
1050 PRINT AT 3,5;"[illegible]"
1060 PRINT AT 6,2;"■ - READ FILES";AT 8,2;"■ - COMPUTE AVERAGE";AT 10,2;"■ - SORT AND DISPLAY IN      ALPHABETICAL ORDER";AT 13,2;"■ - SORT AND DISPLAY IN   ORDER OF MERIT";AT 16,2;"■ - INITIALISE/AMEND FILES";AT 18,2;"■ - SAVE TO TAPE"
1065 SLOW
1070 INPUT M
1080 IF M<1 OR M>7 OR M<>INT M THEN GOTO 1070
1090 CLS
1100 GOTO (1870 AND M=1)+(540 AND M=2)+(790 AND M=3)+(1460 AND M=4)+(1110 AND M=5)+(1170 AND M=6)
1110 FAST
1120 LIST 40
1170 CLS
1180 SLOW
1190 PRINT AT 5,6;N$;AT 10,1;"PRESS PLAY AND RECORD ON TAPE,";AT 14,6;"THEN PRESS ""NEWLINE"""
1200 IF INKEY$<>CHR$ 118 THEN GOTO 1200
1210 SAVE N$
1220 GOTO 1
1460 REM [illegible]
1470 GOSUB 1970
1500 DIM J(E)
1510 FOR B=1 TO E
1520 FOR X=32 TO 1 STEP -1
1530 IF NOT A$(B,X)="," THEN NEXT X
1540 IF NOT A$(B,X)="," THEN GOTO 2000
1550 LET J(B)=VAL (A$(B,X+1 TO ))
1560 NEXT B
1565 FOR V=1 TO E
1570 FOR B=2 TO E
1580 IF J(B-1)>J(B) THEN GOTO 1660
1590 LET C$=A$(B-1)
1600 LET S=J(B-1)
1610 LET A$(B-1)=A$(B)
1620 LET J(B-1)=J(B)
1630 LET A$(B)=C$
1640 LET J(B)=S
1650 IF J(B-1)<J(B) THEN GOTO 1580
1660 NEXT B
1670 NEXT V
1680 GOTO 1800
1700 REM [illegible]
1710 CLS
1720 SLOW
1730 PRINT AT 10,2;"PLEASE WAIT APPROX. ";INT (E*.65+.9);" SECS."
1740 PAUSE 150
1750 CLS
1760 FAST
1770 RETURN
1800 REM [illegible]
1810 CLS
1820 SLOW
1830 FOR U=1 TO E
1840 SCROLL
1850 PRINT A$(U);
1860 NEXT U
1870 FOR U=1 TO E
1880 CLS
1890 PRINT A$(U);
1900 FOR T=1 TO 300
1910 IF INKEY$<>"C" THEN NEXT T
1920 NEXT U
1930 PRINT AT 21,3;"PRESS ANY KEY TO RETURN"
1940 IF INKEY$<>"" THEN GOTO 1940
1950 IF INKEY$="" THEN GOTO 1950
1960 GOTO 1040
1970 CLS
1980 PRINT AT 10,7;"PLEASE WAIT"
1990 PAUSE 150
2000 CLS
2100 FAST
2200 RETURN
3000 PRINT PEEK 16396+256*PEEK 16397-16509
```



Andrew Hewson.



Spanners poked in the Sinclair works

THIS MONTH I answer some problems concerning PEEKing and POKEing. David Anthes of Bridport writes: **My ZX-81 has a bug. When I POKE 57 into various addresses as per page 163 of the manual, I get weird effects. Sometimes the machine crashes but Sinclair claims there is nothing wrong with it.**

When you enter PRINT PEEK address, your computer PRINTs a positive integer number between 0 and 255 inclusive. That is the number which your machine holds in the byte at location "address". The value of "address" must be a positive integer between 0 and 32767 on the 16K ZX-81 or Spectrum.

POKE is the complementary command to PEEK. It puts a number into a location. The form of the command is:

POKE address, number

Where address is a positive integer in the range 0 to 32767 — 16K-machines — and number is a positive integer in the range 0 to 255 it is a dangerous command, because POKEing the wrong location can cause the machine to crash for any one of a hundred reasons. PEEKing is a means of looking at what your computer is doing, whereas POKEing is a way of putting a spanner in the works; if you put the spanner in the wrong place or the wrong spanner in the right place you can cause havoc.

John Hawes of Glamorgan wants to PEEK the ZX-81 display file. He asks: **Is it possible to discover whether a given character is at a given position in the display of the 16K ZX-81?**

There are two golden rules to remember when manipulating the ZX-81 display. They are:

The ZX-81 display file must always contain at least 25 bytes filled with the NEWLINE character, decimal 118.

The 1K ZX-81 display file contains only the characters which have been PRINTed or PLOTted, plus sufficient spaces to fill any gap between the left-hand side of the screen and the character in question. The 16K ZX-81 display file contains 25 lines of 32 characters unless SCROLL has been used since the last CLS. The following routine PRINTs the character at row R, column C of the 16K ZX-81 display file:

```
10 FOR I = 0 to 5
20 PRINT "ABCDEFGHIJKLMNOP
   QRSTUVWXYZ";
30 NEXT I
100 LET D = PEEK 16396 + 256*
   PEEK 16397
110 INPUT R
120 INPUT C
130 PRINT AT 21,0; CHR$ PEEK
   (D + 33*R + C)
```

Steve Packman has a Spectrum and he writes: **A subroutine returns to the line following the line from which it was called. I want to write a program in which the line number to which the return is made depends on the results of calculations within the subroutine. How can this be done?**

The simple solution to his problem is not to use a GOSUB statement but to use GOTO instead. The subroutine can then perform its calculations and return to the appropriate line in the main program by means of a second GOTO statement.

If it is essential to the logic of the program to use a GOSUB statement, then care must be taken to ensure that the program also executes a RETURN statement subsequently. The reason is that the GOSUB statement saves the number of the line in which it occurs at the bottom of the GOSUB stack, which lies immediately below RAMTOP. The RETURN statement deletes the stack entry and causes the program to jump to the line number following the GOSUB line. Therefore if the program executes more GOSUBs than RETURNs, the line numbers accumulate at the bottom of the GOSUB stack, causing it to grow downwards and eventually fill all the spare space in RAM.

When the 16K Spectrum is switched-on, RAMTOP is set at 32599. Owners of the 48K Spectrum should enter CLEAR 32599 to simulate a 16K machine. The following routine looks at the 10 bytes immediately below RAMTOP:

```
9000 FOR i = 32599 to 32590 STEP-1
9010 PRINT i, PEEK i
9020 NEXT i
```

The resulting display is:

32599	62
32598	?
32597	19
32596	3
32595	27
32594	118
32593	31
32592	219
32591	31
32590	237

Address 32599 always contains 62 and the contents of 32598 depend on previous calculations made by the Spectrum. Locations 32597 downwards form the machine stack and need not concern us. One or more addresses can be put on the GOSUB stack using the following routine.

```
10 INPUT j
20 FOR i = 1 TO j
30 GO SUB 100
40 NEXT i
50 GO TO 9000
100 GO TO 40
```

Add that routine to the previous one, RUN it and enter, say, 2 for the value of j. The resulting display is:

continued on page 56







continued from page 55

32599	62
32598	?
32597	2
32596	0
32595	30
32594	2
32593	0
32592	30
32591	19
32590	3

The contents of 32597 downwards have been displaced downwards by six locations. For example, 32591 now contains the value of 19, as 32597 did previously. The contents of 32597 and 32594 each show that the next two lower bytes i.e., 32596 and 32595; 32593 and 32592 respectively contain a two-byte GOSUB address. The GOSUB instruction is on line 30, so it is no surprise to see that PEEK 325095 + 256*PEEK 32596 = 30

It can be seen that to change the RETURN address of a subroutine it is necessary to POKE new values into the appropriate pair of bytes at the top of RAM. The following program calls the subroutine from line 20 but RETURNs directly to line 100 as dictated by the value of the variable "return":

```
10 LET return = 99
20 GOSUB 2000
30 PRINT "LINE 30":STOP
99 REM
100 PRINT "LINE 100":STOP
2000 LET r = PEEK 23730 + 256*
  PEEK 23732-2
2010 IF PEEK r = 2 THEN LET
  r = r-3: GOTO 2010
2020 POKE r + 1, return -256* INT
  (return/256)
2030 POKE r + 2, INT (return/256)
2040 RETURN
```

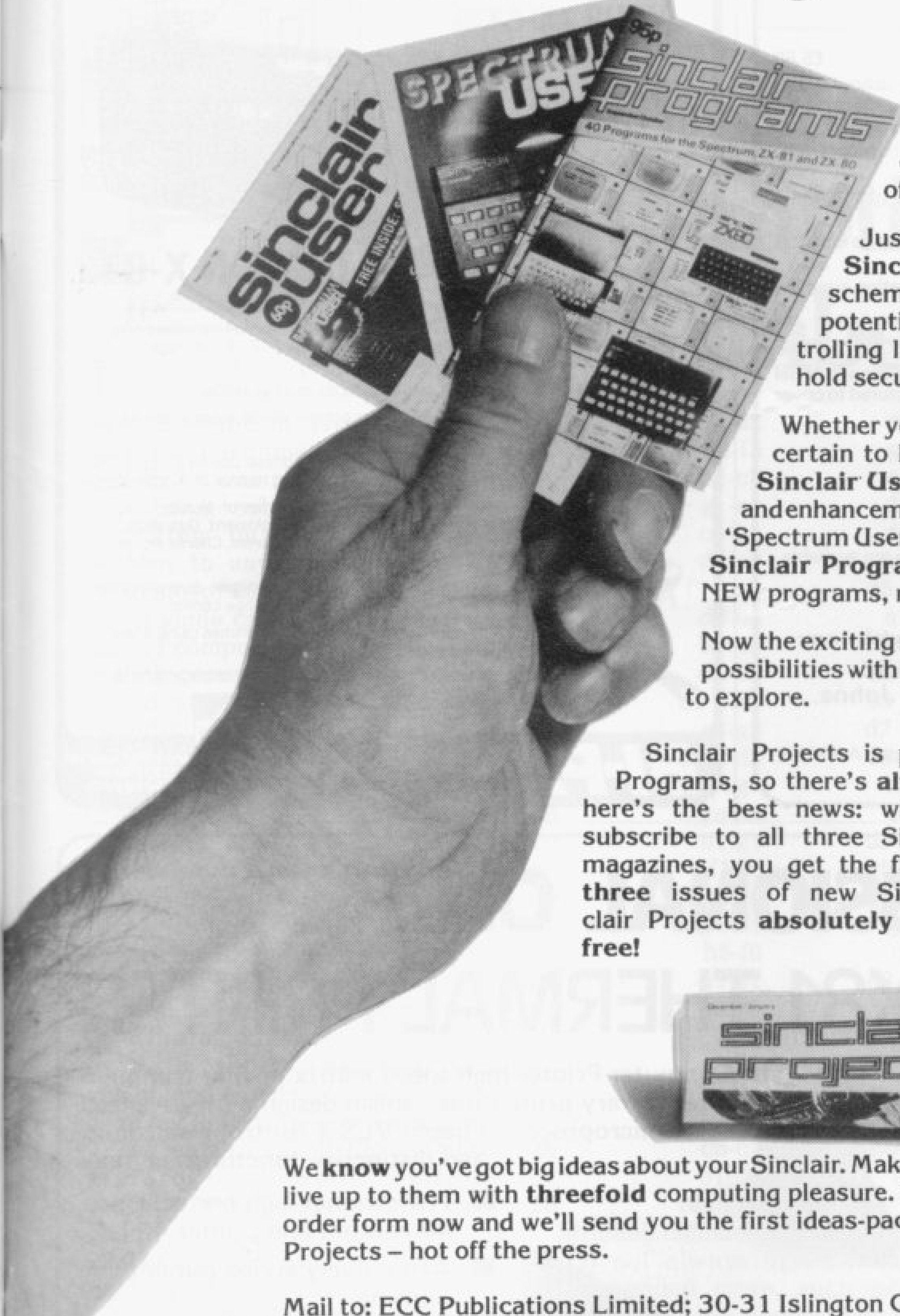
Note that line 99 must exist, or the Spectrum stops with the error message N "statement lost". Thus the problem can be solved by adding lines 2000 2040 to the end of the subroutine and setting the variable "return" appropriately.

Finally, I have to thank several people, including Ettrick Thompson of Aldeburgh, Suffolk, for pointing-out an error in the column in August. I claimed that -3 ↑ 2 = 9 but I was incorrect. Page 201 of *ZX Spectrum Basic Programming* explains that the Spectrum assigns a priority of 10 to the task of raising a number to a power and a priority of 9 to changing the sign of number.

The parts of an arithmetic expression are evaluated in order of priority; therefore 3 ↑ 2 is evaluated before negation takes place. In other words -3 ↑ 2 is evaluated as if it were written as -(3 ↑ 2) hence the Spectrum is correct and I was not.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

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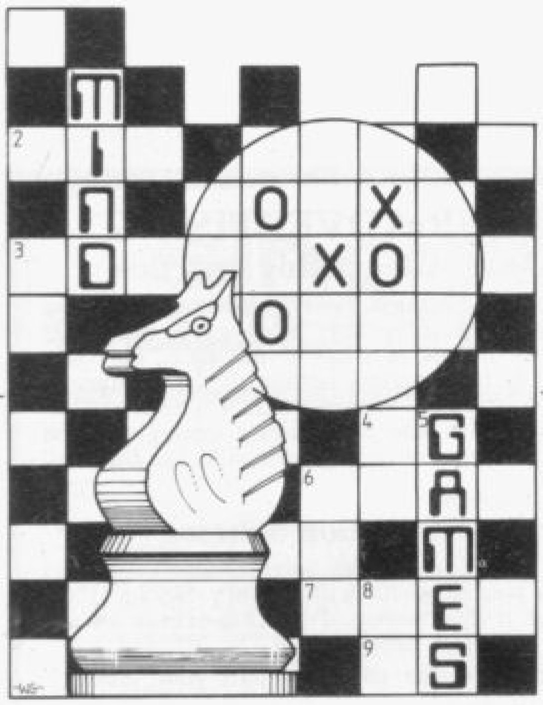
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Philip Joy looks at a superior program

Attempting to beat the unbeatable Nim

IN A RECENT article a game of **Nim** was mentioned from John Williamson of West Lothian. I said that the game was unbeatable and that I was not sure whether it was being sold. It still remains unbeaten but Williamson has written to say that he sells the program for £3.95. The cassette also has a game called **Close the box,** a kind of computer dice-rolling game.

Both games were very good and would amuse children. The price includes postage and packing and it can be obtained from Dunrobin Software, 37 Rivaldsgreen Crescent, Linlithgow, West Lothian EH49 6BB.

Now for a review of two programs sent by N Sugden from Surrey. The first is another copy of **Nim,** with a Space Invaders-type game on the back. The **Cosmo Attack** does not present much of a challenge and on its own would not justify selling the program tape. The **Nim** is a variable-pile version and has not been beaten with seven rows as yet.

The game has all the standard features and would sell the cassette. It would probably amuse a child for a short time. The price is £2.95 and includes postage and packing. All the instructions are printed by the ZX printer. The cassette is available from N Sugden, 17 Newbolt Avenue, Cheam, Sutton, Surrey SM3 8ED.

Now for a game and some comments on Artic **ZXchessII.** I have included some of the comments from this letter previously but not the game. The sender is Mr Mitchell of Leicester. Here is a game which shows the player resigning on the 28th move:

	Player	ZXchessII
1	d2-d4	g6-f6
2	e2-e3	d7-d5
3	f1-d3	b8-c6
4	c1-d2	c6-g4
5	f2-f3	g4-c8
6	b1-c3	e7-e5
7	g1-e2	d8-d6
8	c3-b5	d6-d7
9	d2-c3	e5-e4
10	f3 × e4	d5 × e4
11	d3-c4	a7-a6
12	b5-a3	b7-b5
13	d4-d5	f8 × a3
14	b2 × a3	b5 × c4
15	e2-g3	d7 × d5
16	d1 × d5	f6 × d5
17	c3 × g7	h8-g8
18	ge-h5	e8-e7
19	e1-g1	d5 × e3
20	f1-f6	g6 × g7
21	f6 × c6	g7 × g2
22	g1-h1	g2-g5
23	h5-f6	c8-f5
24	a1-e1	e3 × c2
25	f6-d5	e7-d7 (players move recommended, which was f6-e4)
26	c6-c7	d7-d6
27	e1-d1	f5-g4
28	resigns	

Mitchell comments on ZXchessII: "I do not always agree with the recommended move, such as the 25th move of the player. Any long-term traps waiting to be uncovered are just ignored and that probably has something to do with the end-game being less than positive.

"In fact, the only significant advantage of this game is that it has a save option." I would be grateful if anyone could send details of how they think the ZXchessII plays compared to other versions of chess for the ZX-81, or any details of the chess game on the ZX-81.

Next month I shall be reviewing another version of Nim and a **Flight Simulator** written in Basic, written so that the novice can see how it works and make changes to the program. From first appearance the Nim is a well-displayed version and the Flight Simulator is as near to life as a Basic version could be.

Mike Farley from Berkshire has sent some guidelines for what he thinks an adventure game should be like. He gives seven points:

> 'The variable pile version has yet to be beaten with seven rows'

The game must have locations and the player must be able to move both forwards and backwards between locations.

The scenario should be fixed and not randomly-generated.

Each location must have a description, either pictorial or textual — not just a point on a map.

The game is not played in real-time — it is not a reaction test like Space Invaders.

There must be objects to be collected and used in reasonably logical manner, bearing in mind magic is always possible. It must also be possible to list the items being carried.

The use of random numbers should be kept to a minimum.

A wide vocabulary must be used. That is a major condition, as conversation with the computer is an essential part of the game.

Do readers agree?

Please send comments or programs to Philip Joy, 130 Rush Green Road, Romford, Essex RM7 0DA. If you want anything returned, please enclose an sae.



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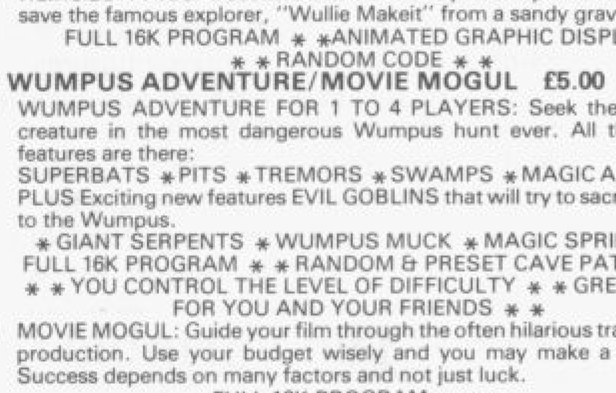
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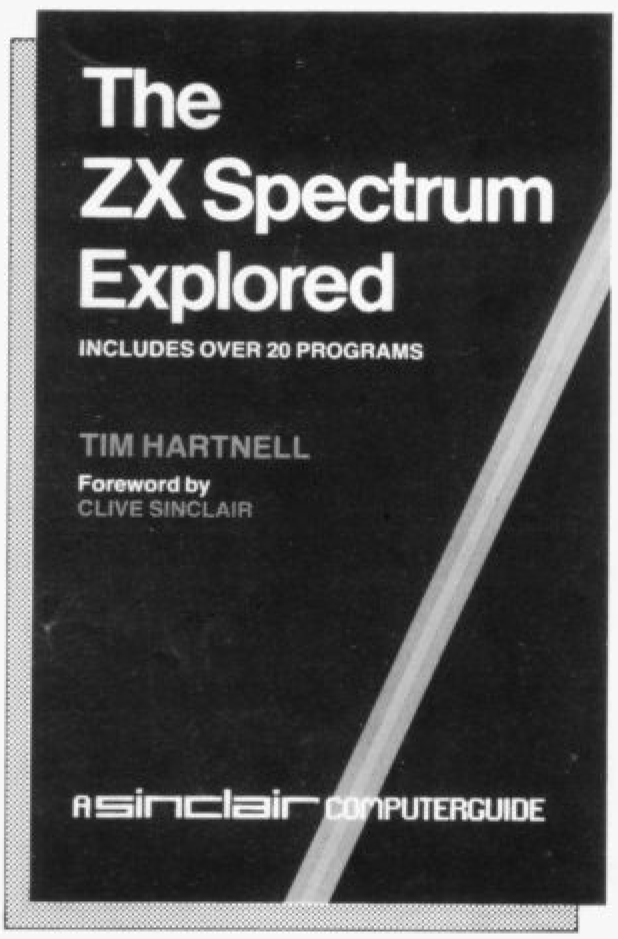
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